VETERINARY NOTES FOR HORSE OWNERS

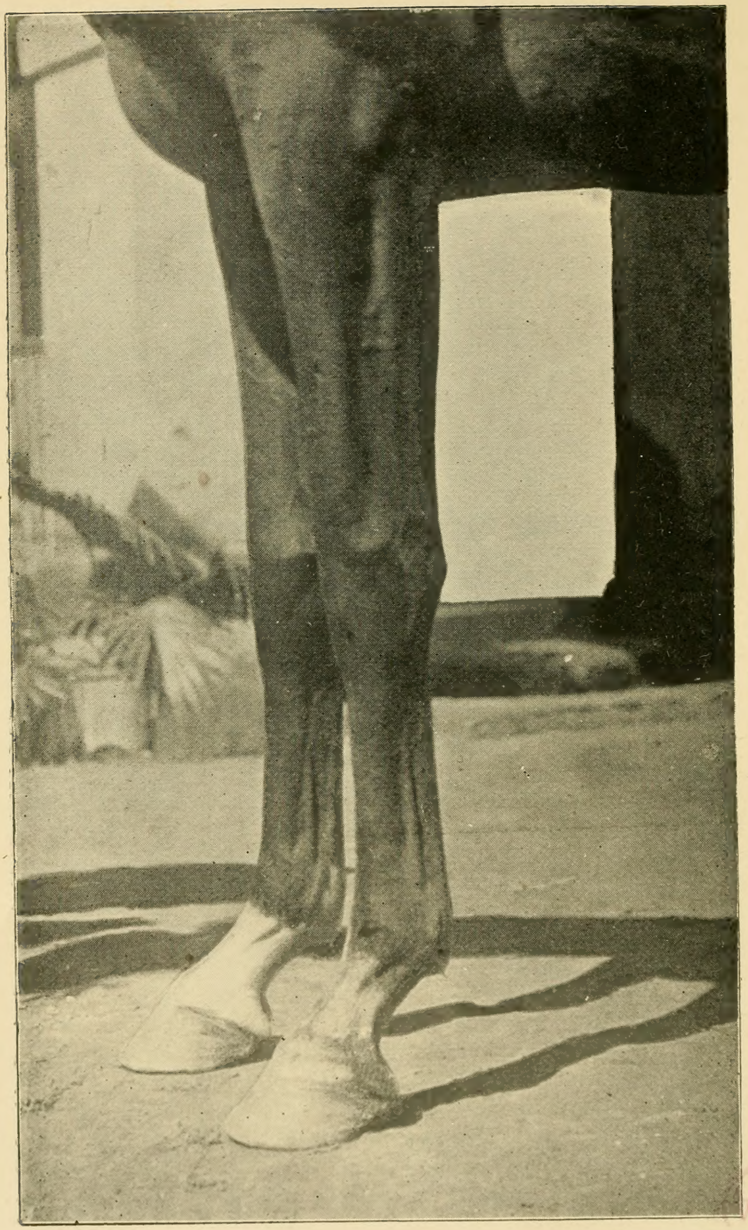
SIXTH EDITION

CAPTAIN M. H. HAYES

VETERINARY NOTES

FOR HORSE OWNERS.

1st	*Edition,*	*1877*;	1,250	copies.
2nd	,,	*1880*;	2,500	,,
3rd	,,	*1884*;	2,500	,,
4th	,,	*1889*;	3,000	,,
5th	,,	*1897*;	4,500	,,
6th	,,	*1903*;	5,000	,,



Frontispiece.

CLEAN FORE LEGS.

VETERINARY NOTES

FOR HORSE OWNERS.

A MANUAL OF HORSE MEDICINE, AND SURGERY, WRITTEN IN POPULAR LANGUAGE.

BY

M. HORACE HAYES, F.R.C.V.S.,

Late Captain "The Buffs."

Author of "Points of the Horse," "Riding and Hunting,"
"Stable Management and Exercise,"
"Illustrated Horse-breaking," etc.

WITH 267 ILLUSTRATIONS, CHIEFLY REPRODUCTIONS OF PHOTOGRAPHS.

SIXTH EDITION. REVISED, ENLARGED, AND 123 PHOTOGRAPHIC ILLUSTRATIONS ADDED.

London:
HURST AND BLACKETT, LIMITED
13, GREAT MARLBOROUGH STREET
1903

VETERINARY NOTES
FOR HORSE OWNERS.

A MANUAL OF HORSE MEDICINE AND SURGERY,
WRITTEN IN POPULAR LANGUAGE.

BY

M. HORACE HAYES, F.R.C.V.S.,
Late Captain "The Buffs,"

Author of "Points of the Horse," "Riding and Hunting,"
"Stable Management and Exercise,"
"Illustrated Horse-breaking," etc.

WITH 267 ILLUSTRATIONS, CHIEFLY REPRODUCTIONS OF PHOTOGRAPHS.

SIXTH EDITION, REVISED, ENLARGED, AND 123 PHOTOGRAPHIC
ILLUSTRATIONS ADDED.

London:
HURST AND BLACKETT, LIMITED
13, GREAT MARLBOROUGH STREET
1903

PRINTED BY KELLY'S DIRECTORIES LTD.
LONDON AND KINGSTON.

PREFACE TO THE SIXTH EDITION.

THE experience I had as an owner, trainer and rider many years ago in India, impressed on me so strongly the necessity of acquiring veterinary knowledge, that when I obtained a year's furlough in 1876, I returned to England and spent my military holidays at the New Veterinary College, Edinburgh. At the end of this first year's veterinary course, I found that I had made so many notes which would be useful to horse-owners in general, as well as to myself, that I collected them into book form, and had them published under the title of "Veterinary Notes for Horse-owners." Three years later, I was fortunate to get another year's furlough, which I also spent among my former friends and instructors. My studies were greatly facilitated by the generous and valuable help of the late Professor Williams, Professor A. Johnston and other teachers, whose patience I sorely tried by continual questions as to the "why" and "wherefore" of the veterinary treatment of horses.

As the first edition of the "Notes" had sold out before the end of my second year's veterinary course, I was able to add a great deal of useful new matter to the second edition, which received increased appreciation from the public. I brought out the third edition after I had obtained the diploma of the R.C.V.S. and had retired from the Army. Since those ancient times, I have continued to treat this work as a horse-owner's note-book, in which I have recorded all the useful veterinary information I have been able to obtain about horses, from personal experience, friends and books.

Hence it is invaluable to me as a work of reference, for if I had not written it, I would have probably forgotten at least half of what I had seen, heard and read. I trust that it will be of equal benefit to my readers, whether they are horsemen of ordinary education or veterinary surgeons. The fact that I have spent a large portion of my life in many foreign countries, ought to make this book of special use to English horse-owners who live abroad.

I have employed type of different sizes, with the object of maintaining the character of this book as a means of ready reference for non-professional readers, without having to exclude information which they might consider to be too abstruse for their requirements ; but which might prove useful to horse-owners possessing more scientific knowledge.

This edition is to a large extent a new book, because I spent three years revising it, and have added much new matter and 123 new illustrations from photographs I took. In the building up of this literary structure, I have been greatly aided by the valuable hints and kindly criticisms which I obtained from Veterinary-Surgeon Desmond, Colonel Nunn, Deputy-Director-General A.V.D., Mr. J. S. Barber, M.R.C.V.S., Mr. Reginald Over, M.R.C.V.S., and other learned friends. In making a collection of horses' heads of authentic ages for the illustrations in Chapter XXXIII., I am particularly indebted to Mr. W. Shaw, F.R.C.V.S., Mr. Wharam, M.R.C.V.S., Mr. E. H. Leach, F.R.C.V.S., Professor Hobday, F.R.C.V.S., Mr. Hiles, M.R.C.V.S., and other *confrères*. Thanks to the generous help of these gentlemen, I have succeeded in a photographic task which, as far as I can ascertain, has never before been accomplished. Mr. Barber and Mr. Willis, M.R.C.V.S., were most kind in lending me many interesting specimens to photograph.

To facilitate reference, I have tried to make the index as complete as possible.

As a chemist's shop is not always within easy reach,

especially in foreign countries, I have frequently, when describing the treatment of a particular ailment, given several recipes, so that the absence of one or more drugs might not defeat success. In these lists, priority has been accorded to merit, as far as practicable.

Underneath all the illustrations which are not original, I have named the respective sources from which they were obtained.

Yew Tree House, Crick, Rugby,
1st January, 1903.

CONTENTS.

CHAPTER VI.

CHAPTER VII.

CHAPTER VIII.

CHAPTER IX.

CHAPTER X.

CHAPTER XI.

CHAPTER XII.

CHAPTER XIII.

CHAPTER XIV.

CHAPTER XV.

CHAPTER XVI.

CHAPTER XVII.

CHAPTER XVIII.

CHAPTER XIX.

CHAPTER XX.

CHAPTER XXI.

CHAPTER XXII.

CHAPTER XXIII.

CHAPTER XXIV.

CHAPTER XXV.

CHAPTER XXVI.

CHAPTER XXVII.

CHAPTER XXVIII.

CHAPTER XXIX.

CHAPTER XXX.

CHAPTER XXXI.

CHAPTER XXXII.

CHAPTER XXXIII.

LIST OF ILLUSTRATIONS.

CHAPTER I.

Detection of Lameness.

DEFINITION—CONDITIONS OF EXAMINATION FOR LAMENESS—POINTING—SUITABILITY OF THE TROT AS A PACE AT WHICH TO DETECT LAMENESS—MOVEMENTS OF THE HEAD IN LAMENESS—DETECTION OF LAMENESS DURING MOVEMENT—PECULIARITIES OF ACTION—METHOD OF FINDING OUT WHETHER THE SEAT OF LAMENESS IS OR IS NOT ABOVE THE FETLOCK.

DEFINITION.—A horse is lame when pain or inability causes him, during movement, to alter the usual distribution of weight on one or more of the limbs; or to alter the normal "play" (extension and flexion) of any of their joints. Irregularity of gait is commonly supposed to constitute lameness. A horse which is "lame all round" may, however, go "level." Although deficiency of action is its usual cause, the lameness of stringhalt is due to its excess. In the case of a horse which is equally lame on all his legs, the duration of their periods of contact with the ground, and the "play" of one or more of their respective joints will not be normal. In the majority of such cases, either the toe or the heel will be unduly favoured in the distribution of weight.

Percivall defines lameness "as the manifestation in the act of progression, by one or more of the limbs, of pain or weakness, inability or impediment." We here come to the important division of mechanical lameness, and lameness from pain. Under ordinary circumstances it is difficult to say when the former is wholly uncomplicated by the latter. If a horse is lame, for instance, from a stiff joint which exhibits no inflammatory symptoms after work, and if the nature of the lameness is unaffected by work, we may

reasonably infer that the lameness is accompanied by little or no pain. Depriving the foot of feeling by neurotomy (p. 669), or by the injection of cocaine (p. 608), in old cases of foot-lameness, as from ringbone, is so often followed by removal of the defect in the gait, that I am inclined to think that purely mechanical causes, especially in foot-lameness, give rise to lameness much less frequently than might be supposed.

Lameness may be shown: (1) when the foot of the lame leg is on the ground, as when the horse is suffering from a painful corn; (2) when the foot is raised, as in the case of stiffness of the knee, without pain; and (3) when the foot is on the ground and when it is off the ground, as in acute pain of the fetlock joint.

Under the heading of lameness we may include for convenience sake, "pointing" (p. 3) of a foot.

CONDITIONS OF EXAMINATION FOR LAMENESS.—In the examination of a horse for lameness, we should first try to find out the affected leg, and then should endeavour to discover the seat, in that limb, of the disease or inability.

Cases of slight lameness behind, especially those of spavin and stringhalt, are often best seen when the horse is made to turn on his forehand to one side and then to the other in the stall or box. We may then observe that he will shift the weight on to one hind leg, quicker than he will do on to the other, which we may consequently regard as the unsound limb.

We may consider the detection, during movement, of lameness under two heads: (1) When the man who "shows" the horse endeavours to make him stand or move in as sound a manner as possible. (2) When the examination is under our own control.

In the first case, an unwary purchaser may be easily deceived by a clever "coper," whose usual dodges are as follows:—Before the horse is brought out of the stable he is "warmed up" by being threatened with the whip and voice, so that he may forget the pain in his feet and legs, and be ready to dance and prance about at the slightest sign from his master.

The softest ground is chosen on which to show off his action.

He will be led in a curb or Pelham—not a snaffle—and be held tightly by the head, which will be kept in a raised position, so as to prevent him from "nodding" it, or throwing it up. Some excuse will be framed for not letting him trot; but if that pace be insisted on, he will probably be led on the lame side, if lame in front, with his head turned towards the affected limb. Or he may be ridden with a sharp bit and a tight curb chain.

If the horse is lame on one fore leg, and it is feared that a somewhat strict examination will be made, the coper may pare

down the hoof of its sound fellow, after removing the shoe, so as to make the animal equally tender on both fore feet, when the shoe of the sound foot has been replaced. The horse's apparent stiffness of gait might then, if remarked upon, be accounted for by alleging want of action, naturally cramped manner of going, &c.

Leaving the copers to the prosecution of their nefarious trade, we shall now consider the examination of the horse under the most favourable circumstances.

POINTING.—Our first step should be, if possible, to see the animal in the stable when he is standing quietly, and is free from all excitement. If sound, he will often rest one hind leg by bending its fetlock, while he keeps both fore legs firmly planted; and, after a time, will ease the other hind leg, which, in its turn, will be relieved by its fellow; and so on. Although under ordinary conditions, one fore leg may be slightly advanced beyond the other; it will not, unless when diseased, be relieved of its fair share of weight; for the horse will normally stand, when on level ground, with an equal bearing on both fore legs. A fatigued horse, though sound, may, however, rest a near hind and an off fore, or an off hind and a near fore, alternately. A horse lame in one fore leg, usually stands with its pastern straighter than with that of the sound one.

A horse is said to "point" with a fore leg, if, while standing still, he keeps it advanced beyond its fellow. He may thus rest it with only the toe on the ground, with only the heel on the ground, or with the foot brought flat down. If we find that a horse points with one foot, while maintaining a position which indicates that he prefers to stand in a constrained attitude rather than to put weight on it, we may reasonably suspect he is lame on that limb. As far as I am aware, the term "pointing" is used only with reference to the fore legs.

As a general rule, when the disease is in the front of the foot, the animal will be inclined to rest only his heel on the ground; but when it is near the back of the foot, he will often raise the heel. The former attitude is that which is adopted in cases of acute laminitis, and generally in those of painful ringbone; the latter, by horses suffering from confirmed navicular disease. In most cases of pointing, when the disease is not in the foot, the horse keeps the joints of the foot bent, and the heel consequently raised. In very bad cases of lameness in the hind leg, the animal may keep the foot off the ground (Fig. 101, p. 271).

At the commencement of navicular disease, the horse sometimes points by simply keeping the foot advanced, with the heel as well as the toe on the ground; but he soon begins to support the foot

1*

only by the toe, and to "round" the fetlock joint. In some rare cases he will stand "level."

Lameness is often manifested by the horse frequently shifting his feet when standing.

"The pointing of elbow lameness is characteristic, the fore arm being extended, the knee in a state of flexion, and the foot perhaps on a level with, or posterior to its fellow. In severe shoulder lameness, the pointing, if it can be called such, is backwards, the limb relaxed, knee bent, and the foot posterior to its fellow; sometimes the toe only touches the ground; the whole limb semi-pendulous, consequently upon the inability of the muscles to elevate and bring it forward without pain" (*Williams*).

In acute laminitis, when the disease is in the fore feet, the horse advances them, so as to relieve their toes of pressure, and to throw the weight of the body on the hind limbs. When in the hind feet, he draws back his fore feet, and advances his hind feet with a similar object.

Animals affected with navicular disease, often acquire the habit of lying down a great deal in their stalls.

SUITABILITY OF THE TROT AS A PACE AT WHICH TO DETECT LAMENESS.—In the walk, slow trot, and amble, each fore limb and each hind limb bears normally the same weight as its respective fellow; but in the canter and gallop more weight is thrown on the leading fore leg and the opposite hind leg, than on their respective fellows. Hence, a just comparison between the respective actions of the two fore legs or the two hind ones can be easier made at the walk, slow trot, or amble, than at the canter or gallop. As the amble is an artificial pace which few horses will adopt without special training, we need not consider it here. In most cases, the trot is more suitable for detecting lameness than the walk; for it is a diagonal pace of two time (near fore and off hind, and off fore and near hind); the walk being one of four time. Hence, when the lame leg comes down on the ground at the walk, it has the support of two other legs; but only of one other leg (its diagonal fellow) at the trot; and consequently more weight falls on the lame leg at the latter pace, than at the former. If a horse which is lame in a fore or hind leg, is trotted, he will favour the unsound limb at the expense of its sound diagonal fellow. Thus, if lame in the near hind, he will put more weight on the off fore than on the near fore, and will consequently appear to be also lame on the near fore. The reverse of this, but to a less extent, will occur when the lameness is in front. Such cases of so-called "cross lameness" are more apparent when the lameness is behind than when it is in front, because the fore limbs exhibit lameness in a more

easily discernible manner than do the hind ones. It not unfrequently happens that an inexperienced observer imagines that a horse which is lame behind, is lame in front; but he would not fall into this mistake, if he compared the respective action of both pairs of limbs. The slow trot as a rule is a much better pace at which to observe lameness than the fast trot, because the slower the pace, the more time we have to note any difference of gait. Also, the faster the trot, the more inclined is it to depart from its normal two time. In fact, if we refer to the admirable photographic reproductions in Muybridge's "Animals in Motion," we shall see that the fast trot is sometimes a pace of four time.

MOVEMENTS OF THE HEAD IN LAMENESS.—When a lame horse is in movement, he uses (if he is at liberty to do so) his head and neck as a balancing pole to relieve the unsound limb of weight as far as possible. Thus, if he is lame in front, he will raise his head when the lame leg comes down, and will bring it more or less into its natural position, when the sound fore leg touches the ground. If he is lame on a hind leg, he will lower his head, when the opposite fore leg comes down. For instance, if the near hind be affected, he will lower his head when the off fore comes down.

DETECTION OF LAMENESS DURING MOVEMENT.—Lameness must be very acute for a horse to show it in the walk. When taken at the trot, the animal should be led in a halter or snaffle bridle with plenty of rein, so that the man who leads him may not interfere with the movements of his head. The most misleading kind of interference in this respect, is making the horse incline his head and neck towards the man who leads him, the result being that the animal will be prompted to put more weight on the fore leg next to the man, than on its fellow. Immediately on leaving the stable, the horse should be trotted for inspection on hard ground, which should be free from stones and other inequalities. The observer should stand about thirty yards in front of the horse and on the near side. He should note, as the animal approaches, whether the horse "dwells" in the slightest on one fore foot more than on the other, and whether he raises or depresses his head more than usual. If the horse shows irregularity of gait or of head movement, the observer may conclude that the abnormal action is due to an attempt to relieve the lame leg of weight. Here, also, we must allow for the effect of "cross lameness;" and we should try to find out at what period of the step (support, suspension, or both) the lameness is manifested.

If a horse is lame on both fore or both hind legs, he will go short and stiff, and will try to take weight off the infirm pair of limbs by

keeping his head high or low, according as he is lame in front or behind. We should then take him on to soft ground, and have him slowly trotted on it. If a marked amendment in the gait is then observed, we may regard our suspicions as confirmed. The best time to note lameness in front is when the horse is being turned; for the turn of the led horse will be principally on the forehand, upon which there will consequently be an increased amount of weight thrown at that moment.

When the defective gait is characterised more by shortness of step and want of freedom in placing the feet on the ground, than

Fig. 1.—Wear of toe of hind foot from spavin.

by irregularity in the series of steps, we may safely conclude that both fore, both hind or all four legs are unsound. Irregularity of gait will be particularly accentuated at the trot, if the animal is lame in a fore leg and in its opposite hind leg, supposing that the other two legs are free from pain and inability.

Some veterinary authorities advise a person who is trying to find out if a horse is lame behind, to take a rear view of the croup in order to see if the animal "hitches up" one quarter (that of the unsound side) more than the other, in the endeavour to keep weight off the painful limb. I venture, however, to say that the horse "hitches up" the quarter in a manner sufficiently marked to attract attention only when he is unquestionably lame. In doubtful cases, I prefer to try and detect (from behind and at both sides) if, when, trotting, he dwells more on one hind foot than on its fellow (the unsound one); if he raises it higher off the ground; and particularly, if he drags one toe (that of the unsound side).

The dragging of the toe, if the horse has been at work, will generally be accompanied by wear at that part (Fig. 1).

When the horse has trotted past about thirty yards, he should be turned, somewhat sharply, to the "right about" (for instance), and the person who is examining him should note the manner in which he turns, so as to be able to compare it with the way he goes to the "left about" the next time he turns. In this second trot past, the observer should try to detect if there be any difference in the action of the horse, as viewed from the off side, from that which it presented when regarded from the near. If, after two or three trots past, there be any doubt remaining, perhaps the best way to solve it is to mount the animal or put him in harness, and trot him, alternately, slowly and rapidly, for a short distance on hard ground, with a change on soft ground, and give him a few moderately sharp turns.

Fig. 2.—Holding up hind leg to test for spavin.

If we suspect the existence of spavin, we may take up the foot and bend the hock (Fig. 2), retaining it in that position for about a minute. If, after that, the animal trots sound, we may consider the joint to be all right.

In obscure cases of lameness, we may suspect bone disease—such as incipient ringbone—as the cause, if the horse stands level in his stall, but trots very lame on hard ground.

In all cases, we should try if the animal backs with freedom and regularity of gait. Failure to do so, will often be indicative of "shivering" (p. 565).

At this stage of the examination, if no lameness be discovered, we should send the horse a strong gallop (say, for a mile), a fast four or five miles' trot in harness, or an equivalent pull in heavy draught, according to the class of animal; then put him into a stall, allow him to stand at least half an hour, so that he may thoroughly cool down, and try him again at trotting as before. If he passes satisfactorily through this second ordeal, we may justly regard him to be sound in limb.

Certain obscure cases of lameness can be detected only during the first few steps the animal takes on quitting his stable; for he may subsequently "work sound." Such cases are usually caused by insidious and serious disease in its early stages.

Lameness at its first commencement, in the 'cross-country horse, is often evinced by want of customary freedom and boldness in fencing; and in the racehorse, by a slight shortening of stride; by unaccustomed inability to "act" well on hard ground; by showing an unusual preference for leading with one leg (the sound one) rather than with the other; or by changing the leading leg oftener than usual.

PECULIARITIES OF ACTION.—"Some horses, from bad riding or driving, acquire a sort of 'hitch' or 'lift' in their trot" (*Percivall*).

If a sound horse, when trotting, has his head turned towards the man who leads him (on the near side, for example), going in a sort of "left shoulder in" fashion, he may appear, as already remarked, to be lame on the off fore leg, on account of putting an increased amount of weight on the side to which the head is turned. On the same principle, a sound horse may appear to be lame on the "outside" leg when trotted on a small circle.

Some horses, when trotting very fast, appear to go lame behind, by reason of the hind legs not being able to keep time with the fore.

I have known a horse always to go lame in harness, although he went quite sound in saddle; the cause being that on a previous occasion, when working between the shafts, one of his shoulders became galled, and continuing the work for some time in that state, he acquired the habit of bearing against the collar as much as possible with the other shoulder. This harness-lameness, if I may use the term, is not unfrequently seen in animals which have a sore spot under the bearing surface of the collar.

Intermittent lameness may be caused by rheumatism, and may also characterise the early stages of navicular disease.

Lameness improves with exercise, except, as a rule, in cases of splints, sore shins, corns, laminitis, and sprains.

A horse suffering from navicular disease goes uphill sounder than he goes down; the reverse is the case in laminitis.

When an animal is lame behind, the disease is generally in the hock; when in front, in the feet of cart-horses, and in the ligaments, tendons, or cannon bones of those which are used for fast work.

When a horse goes lame on a fore leg without any perceptible cause, and wears away the toe of the shoe, we may suspect that foot of navicular disease. But if he goes on the heel, the probability is that he has either laminitis or ringbone. If the lameness is behind and the toe becomes worn, we shall generally find that it is due to spavin.

Side-bones are chiefly confined to cart-horses, sore shins to race-horses, and navicular disease to cab and carriage horses. Navicular disease and occult spavin are rarely found in horses under seven years of age.

METHOD OF FINDING OUT WHETHER THE SEAT OF LAMENESS IS OR IS NOT ABOVE THE FETLOCK.—Use cocoaine in the manner described on page 608.

CHAPTER II.

Blood.

HEART AND BLOOD-VESSELS—CIRCULATION OF BLOOD—BLOOD—COAGULATION OF BLOOD—NUTRITION AND WASTE—DISTRIBUTION OF BLOOD IN THE BODY—ANÆMIA—CONGESTION—INFLAMMATION—REPAIR AFTER INFLAMMATION—COUNTER-IRRITATION—BLEEDING.

HEART AND BLOOD-VESSELS.—The heart (Fig. 3), which is a hollow muscle, is divided by a longitudinal partition into two independent parts, namely, the right side and the left side. Each of these is separated into two compartments (an auricle and a ventricle) by a valve, which, under conditions of health, allows fluid to flow from an auricle into the ventricle of its own side; but does not permit it to go in the opposite direction. The heart is of a more or less conical shape, with the apex pointing downwards. The auricles, which are much smaller than the ventricles, occupy the base, and the ventricles the remainder of the heart. The left ventricle opens into the aorta, which is the largest of all the arteries, and which, shortly after leaving the heart, splits up into branches that distribute their still smaller ramifications to every part of the body, and finally terminate, as a rule, in capillaries. In Fig. 3, the aorta and its branches, the pulmonary arteries, the veins of general circulation and the pulmonary veins are respectively shown, for convenience sake, as consisting of a single trunk. The capillaries are found in countless numbers throughout the entire system. These minute tubes have extremely thin walls, are about $\frac{1}{3000}$ of an inch in diameter, and probably do not exceed $\frac{1}{45}$ of an inch in length. They open into the veins, which are very small at first; but gradually uniting with each other, enter the right auricle by two large branches, and a few small ones. The right auricle communicates, as I have already said, by a valve with the right ventricle, which opens into the pulmonary artery. This artery proceeds to the lungs, and becomes split up into branches and finally into capillaries that spread themselves through the air-cells of the lungs. These air-cell capillaries unite to form the pulmonary veins, which open into the left auricle.

CIRCULATION OF BLOOD.—Each side of the heart acts like one of those india-rubber pumps which, when dilated, becomes filled with fluid by means of a tube at one end, and which, when squeezed by the hand, drives the contained fluid through a tube at the other end, on account of the presence of a valve preventing its return through the tube by which it entered the bulb. Here, the tube of entrance is the veins and the auricle; the bulb,

the ventricle; the tube of exit, the artery; and the pressure on the bulb is effected by the contraction of the muscular walls of the heart, at more or less regular intervals of, in the horse, about 40 in the minute.

Starting at the left ventricle, we find that the blood contained in it, being prevented by the valve of that side from entering the left auricle, is driven by the contraction of the heart through the arteries, capillaries, and veins of general circulation, into the right auricle, from which it escapes past the

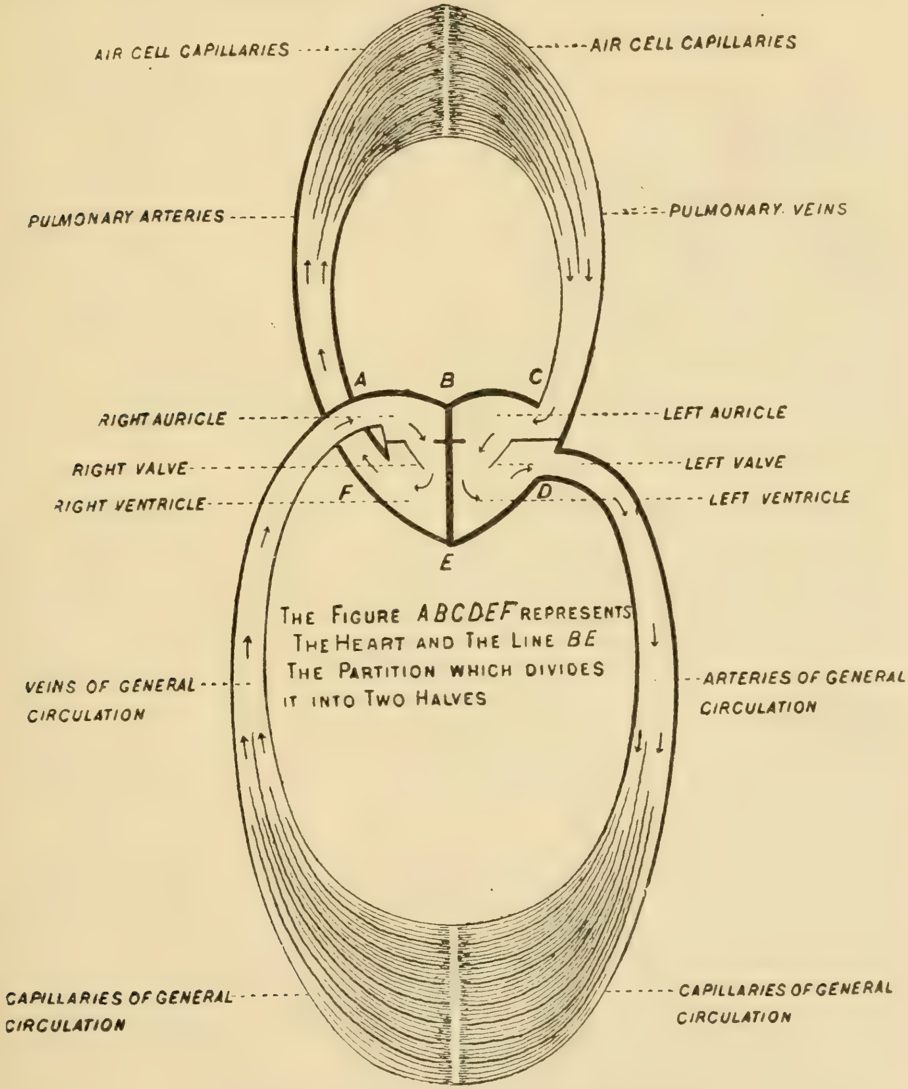


Fig. 3.—Diagram of the circulation of blood.

valve of the right side, into the right ventricle. It is then driven by the contraction of the right side of the heart, which occurs simultaneously with that of the left side, through the arteries, capillaries and veins of the pulmonary circulation, until it flows into the left auricle, and finally past the left valve into the left ventricle, where it completes its circuit, to be again pumped round in the same way. According to the experiments of Hering and

Vierordt, the blood of the horse takes about 31 seconds of time, and about 27 contractions of the heart to complete the entire round.

The circulation of blood from the left ventricle to the right auricle is called the general circulation; that from the right ventricle to the left auricle, the pulmonary circulation. The former is concerned with the general nutrition of the body, including the lungs; the latter, with the purification of the blood by means of the air-cells. The heart, arteries, capillaries and veins thus form a system of pipes through which the blood circulates. The walls of these vessels, with the exception of those of the capillaries and the very small veins, are practically impervious to fluid.

BLOOD.—Blood is formed of a watery fluid *(plasma* or *liquor sanguinis)* and microscopic bodies (blood corpuscles) which float in it. The blood corpuscles consist of *red corpuscles* and *white corpuscles (leucocytes)*, of each of which there are two or more kinds. The plasma holds in a dissolved state all the necessary materials for the nutrition, development, and repair of the various tissues of the body. The red corpuscles impart to the blood its characteristic colour, and their colouring matter *(hæmoglobin)* carries oxygen from the air-cells of the lungs to the tissues throughout the body. They constitute nearly one-half of the entire mass of the blood, and are, in man, from 500 to 600 times more numerous than the white corpuscles. The leucocytes have the power of amœboid movement, and of taking into their substance and digesting other microscopic bodies; thus acting as scavengers for the removal of waste matters, and to some extent as protectors of the tissues against the attacks of disease germs. They (or at least, one or more varieties of them) contain fibrin-ferment, to which I shall allude in the following paragraph.

COAGULATION OF BLOOD.—If blood be withdrawn from the body, it will under ordinary circumstances, gradually separate into a solid mass *(clot)* and an amber-coloured fluid *(serum)*. The clot consists of *fibrin*, and blood corpuscles which get caught and enclosed in the delicate network formed by the fibrin. If the withdrawn blood, instead of being allowed to spontaneously coagulate, be briskly stirred up with a bundle of twigs, the fibrin, in place of enclosing the blood corpuscles and becoming thereby more or less dis-discoloured, will adhere to the twigs in the form of elastic, fibrous threads, which will become white on being washed in water. Fibrin does not exist as such in the blood; but is produced by the action of fibrin-ferment (which is contained in the white corpuscles) on a substance *(fibrinogen)* which is held in a dissolved state in the plasma (Hammersten). It seems that under usual conditions, this ferment is not set free as long as the leucocytes remain in the blood-vessels. The white fibrous tissue of tendons, ligaments, muscles, and the connective tissue underneath the skin, resembles fibrin in composition.

Buchner, Nuttall, von Fodor, and others maintain that the serum of the blood has the property of rendering disease germs inert, and thus protects the system from the invasion of these microbes. Ewing ("The Lancet," 19th May, 1894) remarks that "the loss of this normal germicidal power helps us to explain the varying rapidity with which post-mortem decomposition sets in. It is well known that the bodies of persons who have died from different diseases decompose with varying degrees of rapidity. We cannot explain this differing rapidity of decomposition simply by variations of temperature; for under the same external conditions, one body will be decomposed in a few hours, and another may remain undecomposed for several days." Cadéac remarks that the microbes which are taken by the phagocytes (leucocytes and the cells of the tissues) are alive. In fact, we may see, under the microscope, these bacilli moving in their living prison. If the phagocyte be dead, we may observe the microbe which it surrounds, elongating itself, and escaping. The microbes seized by the phagocytes may be virulent, as well as alive. Metchnikoff obtained a cultivation of anthrax by sowing in broth a leucocyte which had enveloped an anthrax germ. The cultivation obtained was virulent.

Serous fluid, which we find in recent serous cysts (p. 333), and which is secreted by serous membranes, closely resembles plasma. In health it does not appear to contain any white corpuscles, and consequently, then shows no tendency to coagulate. Under the influence of inflammation, or even of congestion, there is a greater or less numerous migration of white corpuscles, with the result that their presence in serous fluid gives rise to the deposition of fibrin. It thus differs from serum, which, being deficient of fibrin-forming material, cannot coagulate. Excessive action of serous membranes (*e.g.* as a result of inflammation) in the head, chest, and testicles, for instance, produces respectively, water on the brain, hydrothorax (p. 354) and hydrocele (p. 291).

NUTRITION AND WASTE.—Assuming for the present that immediately before a contraction of the heart, the blood which is in the left ventricle is in a state of comparative purity, it passes with but little alteration through the arteries of general circulation, the walls of which are comparatively impervious to fluids. Having arrived in the capillaries, the pressure on the blood-stream forces a portion of the plasma through the thin walls of the capillaries, so that plasma constantly bathes all the tissues, which take up from it the materials required by them for nourishment and repair. Here, the walls of the capillaries appear to act as a filter to the plasma, in keeping back a large proportion of the fibrin constituents, so that transuded plasma has no tendency, in health, to coagulate in the tissues. In the capillaries, the red corpuscles part with more or less of their burden of oxygen to the tissues. Under normal conditions, the red corpuscles remain in the blood-vessels; but a few of the leucocytes pass, from time to time, through the walls of the capillaries into the tissues, probably to furnish fibrin-ferment to the transuded plasma, or to remove waste matters. In health, excess of plasma and waste products given off by the tissues, are drained away by a system of vessels, called *lymphatics*, which pour their contents into the veins. The absorbent action of the lymphatics is supplemented, to some extent, by that of the capillaries and veins. When the blood arrives in the right ventricle, it is accordingly in an impure condition and has consequently changed the bright scarlet colour which it wore when quitting the left ventricle, to that of a bluish purple. This impure blood, after being pumped from the right ventricle, gives off into the air-cells of the lungs the carbonic acid which it received from the tissues, and taking up a fresh supply of oxygen from the air in the air-cells, arrives bright-coloured and more or less pure in the left auricle, from which it flows into the left ventricle, ready for another circuit. Besides the lungs, other organs, such as the kidneys, skin and liver, remove impurities from the system.

DISTRIBUTION OF BLOOD IN THE BODY.—Under normal circumstances, the amount of blood in the body is just sufficient for its requirements. Hence, if the blood supply be increased or decreased in one part, it will, respectively, be decreased or increased in the remainder of the system. Thus, mental work, or muscular exercise, if indulged in soon after a full meal, will be liable to more or less interfere with the process of digestion, by " drawing " the blood away from the internal organs, to the brain or muscles, as the case may be. The feeling of drowsiness (due to a state of comparative bloodlessness of the brain) experienced after eating, is caused, to a great extent, by the blood-vessels which supply the organs of digestion, being unusually full at the time. The feeling of sleep or even faintness when taking a hot bath and the relief of " fulness of blood in the head " by placing the feet in hot water, illustrate the same fact. Here we have an explanation of the benefit—in cases of inflammation of the organs of breathing, for instance—of warm fomentations to the surface of the body and of counter-irritation (p. 17).

ANÆMIA or bloodlessness may be either local or general. In the former case, it may, as we have just seen, be owing to congestion in other parts; and can also be brought about by cold, pressure, and diminution of the

calibre of the arteries from disease. General anæmia is the term usually applied to a state of ill-health in which there is deficiency in the number of red corpuscles, deficiency in the amount of hæmoglobin, or deficiency in both of these constituents of the blood. It may be due to the effects of disease, bleeding, purgation, etc. As the ruddy hue of health cannot be present on the cheeks of a person whose blood is deficient in hæmoglobin, anæmic people show their ill health in their faces. But as the skin of a horse is thick, covered with hair, and generally full of pigment, we are unable to judge by his complexion whether or not he is suffering from anæmia.

CONGESTION may be either passive or active. *Passive congestion* consists of an accumulation of blood in a part with decreased rate of blood flow, and is caused by (1) diminished action of the heart, as we may see by the swelling of the legs in cases of debilitating diseases. (2) Want of exercise, especially when aided by the force of gravity acting against the return of the blood, as for instance, in the legs of horses which are kept standing for a long time, like those on board ship. (3) Resistance to the veinous circulation, which we can observe in strangulated hernia (p. 284). As the walls of the veins can be far more easily compressed than those of the arteries, it follows that in strangulation of a part, the blood pumped through the arteries is more or less stopped in the veins. (4) Resistance to the arterial circulation. Owing to increased blood pressure and obstruction in the local circulation, the part, as I shall presently try to explain, becomes swollen and lowered in vitality, and will consequently be difficult of cure, if affected by disease or injury, as we may see, for example, in cases of grease or over-reach in chronically filled legs.

Active congestion may be due, among other causes, to the exercise of a normal function, as for instance, congestion of the blood-vessels of the stomach and intestines during digestion; and to anæmia in another part, as in congestion of the liver from chill. If continued too long, as in congestion of the lungs, it may lead to inflammation, of which it is always the first stage.

INFLAMMATION.—Sanderson defines inflammation as "the succession of changes which occurs in a living tissue when it is injured, provided that the injury is not of such a degree as at once to destroy its structure and vitality." It might be defined as the reaction of living tissues after injury; the term, "living tissues," being applied to all the tissues of the body, except the *epidermis* (p. 154), which includes the scarf-skin, hair and hoofs. When inflammation is set up, the circulation of blood in the part, at first becomes, as a rule, quickened for a brief space of time; but soon becomes impeded, until there is more or less complete stagnation of blood. Consequently the blood-vessels become gorged with blood, and owing to the increased pressure there is an excessive escape of plasma and leucocytes into the neighbouring tissues. In health, the amount of this exudation is duly regulated by two opposing forces; one being the blood pressure derived from the contraction of the heart; the other, the tensity of the tissues (Hamilton). When the tissues become less tense from injury (such as a wound, blow, application of a blister, or removal of the skin), the exudation is proportionately increased. In fact, the action of any means (placing our feet in warm water, for instance) which will soften the tissues, or which will relieve them of pressure, will be followed by more or less swelling of the part from this cause. The fact of stagnation of blood occurring, will practically mark the transition from congestion to inflammation. We have no exact knowledge respecting the cause of this stagnation of blood in inflammation. The condition of the walls of a blood-vessel seems, however, to have some connection with the stagnation of blood in it; for according to Cohnheim's experiment, if we expel the blood from the ear of a rabbit, for example, and keep the part, by ligature or other means, bloodless for some time, inflammation will be set up in it, on the blood being again allowed to fill the vessels.

As the filtering power of the walls of the capillaries varies inversely as the blood pressure in them; the exudation of inflammation is rich in fibrin-pro-

ducing material and leucocytes, and is consequently liable to coagulate in the tissues if allowed to remain in them. The result of this coagulation will be the formation of fibrous bands *(adhesions)*, which will, more or less, interfere with the movement of the part. The swelling will also lower the vitality and strength of the part by impeding its circulation. The most rational means for the removal of the exudation, is massage (p. 664) and external pressure (for an example see page 45), which may be increased considerably beyond that which had existed in health. During the course of unchecked inflammation, the blood pressure on the walls of the capillaries causes these vessels to increase greatly in size. In fact, *granulations* (the small, rounded excrescences of "proud flesh") in a wound, consist, as explained by Hamilton, of bunches of abnormally distended capillary loops.

Œdema (the accumulation of fluid beneath the skin) may also result from passive congestion, especially when the part has been weakened by previous attacks of inflammation, as in the case of the filled legs of horses which have done a good deal of work.

Inflammation is generally characterised by pain, heat, swelling, and, if the skin be thin and white, redness. The pain is due to pressure on the nerves of the part; and the swelling, as we have already seen, to the exudation of lymph. The redness, and the heat, which, according to John Hunter, is never in excess of that in the interior of the body, are caused by the presence of an increased supply of blood, as in blushing, for instance.

REPAIR AFTER INFLAMMATION.—The leucocytes which escape from the capillaries into the tissues during inflammation, appear to be of two kinds, namely, one which supplies fibrin-ferment to the exuded plasma; the other which devours dead matter and invading disease germs. These scavengers, having absorbed into their substance waste and hurtful material, may, if few in number, be carried away by the lymphatics. If they are too numerous—by reason of the intensity of the inflammation—for this to happen, the cells of the part, after the inflammation has begun to abate, may, in their turn, absorb the leucocytes which are present and any remaining *débris* or germs, and may then proceed to repair the injury by scar-tissue, as in wounds (p. 63). During the acute stage of inflammation, the cells of the injured part seem to remain paralysed, and do not perform their scavengering and microbe-devouring function until reaction sets in. The leucocytes, on the contrary, play that *rôle* from the beginning of the inflammatory process. The method of repair which I have just described, generally takes place in severe cases of sprained tendon and ligament, in which the presence of the scar-tissue and of the coagulated exudation will be manifested by thickening of the part. If the migrated leucocytes be in too great numbers to be thus removed, they will in all probability die. "When inflammation is followed by an accumulation of leucocytes and of plasma which does not coagulate, the result is a white or creamy liquid called *pus*, and when the surrounding tissues are involved, so that a cavity develops containing pus, we have what is termed an *abscess*" (*Crookshank*). The plasma (serum) of pus does not cogulate, because it is devoid of fibrinogen. Although pus may be an innocuous fluid when it is produced by leucocytes, it is usually of bacterial origin, in which case it contains bacteria that excrete a substance which causes the pus to have a corrosive action on the tissues; hence, the necessity for the destruction of these bacteria and the removal of the pus. Kanthack tells us that an *ulcer* may be compared to an open abscess, and that the granulations formed in both cases, are the result of an attempt to repair, made by the attacked tissues.

Although pus miscrobes are almost invariably to be found in the collection of pus formed under natural conditions; it is possible for pus to be produced in the tissues by the introduction of chemical irritants (croton oil, for instance), without the presence of pus microbes. This microbe-free pus being composed of dead and inert matter, has no power to increase in amount. Pus organisms are found abundantly in impure air, polluted water, on skin and on mucous membranes, even when these two surfaces are in the highest possible state of

health. If the action of the skin or mucous membrane in protecting their respective underlying tissues be weakened by injury, such as a wound, or even by slight inflammation, and if pus microbes gain access to the part, the process of pus formation will in all probability be set up; supposing that these germs are sufficiently numerous. If, however, they be few in number, they may be destroyed by the cells of the tissues taking them into their substance and digesting them. The healthier the part, the greater power will it have to resist an invasion of these microbes. Thus we see that pus is formed under two conditions, namely: injury sufficient to excite its production, and infection, for the accomplishment of which, existing inflammation or an existing collection of pus seems necessary. Pus organisms appear to gain access to deep-seated tissues by means of the blood-stream; probably, having been first taken into the body through the air-passages or alimentary canal. As these microbes have a destructive action on the tissues, and as their presence may give rise to blood-poisoning (p. 532), our efforts should be directed to prevent their invasion and, if they have already commenced it, to kill, or at least to render them inert before removal.

As a great rule, the leucocytes, as we have seen, proceed towards a part which has been injured or into which some foreign body, such as a microbe, has been introduced. The mechanical theory that the leucocytes move in the line of least resistance, does not hold good in all cases; for the presence of certain substances, such as quinine and lactic acid, repel the advance of the leucocytes; while other substances, such as pure water and antipyrine, neither attract nor repel. Almost all microbes exert an attractive influence on the leucocytes. This theory of attraction is strengthened by the fact, as pointed out by Marcus Beck, that the flow of the exudation of inflammation is away from the inflamed area, and that the migration of the leucocytes is towards it. This subject has not as yet gone beyond the bounds of theory.

When inflammation, as in an ordinary sprain, for instance, is not followed by the formation of pus, the exudation usually ceases within twenty-four hours of the accident. New blood-vessels soon begin to be pushed forward from the ends of the divided surfaces into the coagulated fibrin which lies between them, until they finally unite about the end of the first week (Billroth). Owing to the whiteness of our skins, we may by the red appearance of the scar, readily note the presence of blood-vessels in cuts which have been recently inflicted on ourselves and which are healing in a favourable manner. After about a fortnight, the new blood-vessels begin to diminish in size, and altogether disappear in a few months. The scar-tissue gradually contracts, and then becomes white and hard. It may in time degenerate and become more or less absorbed. The process of repair follows the same lines, whether the injury be a wound, sprain, or bruise, for example.

It is instructive to note that the exudation in inflammation does not repair an inflicted injury, which process is effected by the tissues. Further, it seems that the presence of any portion of the exudation which remains unabsorbed, say, for more than twenty-four hours, is actually hurtful, by interfering with the local circulation, and by promoting the formation of adhesions. Means, if possible, should therefore be taken to prevent its occurrence, or at least to hasten its removal.

As the effectiveness of repair is inversely proportionate to the quantity of scar-tissue employed in that process (compare the results, in wounds, of healing by immediate union with those by granulations); we should abstain from applying stimulants (such as blisters, embrocations, and the hot iron) to the seat of injury, until we feel certain that the new vessels in the scar-tissue have become entirely obliterated.

Muscular wasting is frequently seen in the muscles of parts which have been the seat of inflammation, as in sprain of the shoulder (p. 60) and fracture of the pelvis (p. 305). In the former, the muscles covering the shoulder-blade waste; in the latter, those of the croup suffer from atrophy. Disuse is the cause generally assigned to decrease of substance. I am inclined to think that the presence of inflammation, by interfering with the circulation of the

part, and consequently with its nutrition, is chiefly to blame; for in the two cases mentioned, the wasting is local and does not extend to, respectively, the muscles of the forearm or of the second thigh. Interference with the nervous supply of a part, is a strong factor in the production of atrophy.

COUNTER IRRITATION.—By this term is understood the artificial production of irritation in one part, so as to relieve the inflammation or to change the diseased action existing in another part. In veterinary practice, the use of counter-irritation is generally limited to stimulating embrocations (liniments), and blisters. The beneficial action of a counter-irritant for the reduction of inflammation, appears to be due to the fact of its producing a flow of exudation into a part in which the presence of this fluid will cause no harm; the result being that there will be less plasma to escape into the diseased or injured tissues. In such treatment it is evident that the counter-irritant should not be applied on or close to the seat of existing inflammation, which, if that were done, would be aggravated by the softening of the neighbouring tissues. Here, theory and practice prove that it matters little where the counter-irritant is placed, so long as its surface of application is well away from the seat of the previously existing inflammation, and is on tissues which will take no hurt from the artificial inflammation set up in them. Thus, if it be desirable to apply mustard for the relief of inflammation in the lungs, it will be better to rub it over the legs than over the ribs.

When a blister or similar agent is applied to the seat of inflammation, it may be called a stimulant or irritant; but cannot, with any show of propriety, be termed a counter-irritant. The application of warm fomentations, or friction, to the skin, for the relief of internal congestion or inflammation, acts in the same way as a counter-irritant, but less energetically; the function in both cases being to produce anæmia in distant parts. From the foregoing remarks we may see that the popular expression "drawing the blood away from a part," as applied to the action of a counter-irritant, is not incorrect.

Möller explains that when a blister is applied over a bony enlargement (splint, for instance) in process of formation, it acts by producing pressure on the inflamed tissue (the periosteum, in this case), and thus checks exudation.

BLEEDING.—Although bloodletting has gone almost as much out of fashion among veterinary surgeons as among doctors, it is a most valuable remedy for relieving a state of abnormally high blood pressure in the arteries, as may occur in pneumonia or in congestion of the lungs. To this object we may safely limit its use. With respect to the character of the pulse in cases of high arterial pressure, see page 356.

CHAPTER III.

Immunity and Heredity.

In this chapter I shall try to give a sketch of the respective theories of immunity and heredity, both of which have a large influence on disease. Susceptibility is, of course, the opposite of immunity.

Immunity.

Immunity is the power which an individual or a species has to resist the attack of a disease. It may be racial, individual, or acquired; and may be absolute or comparative. For instance, horses possess racial immunity against the scarlet fever of man and the pleuro-pneumonia of cattle. Men are immune from strangles; and ruminants from glanders. Among every species of animal, we find individuals which are more or less refractory to the inroads of a disease to which their fellows show marked susceptibility. The man, horse, or ox which has had one attack, respectively, of smallpox, strangles, or pleuro-pneumonia, will have acquired more or less immunity from a second attack. This acquired immunity is never absolute.

As possessors of comparative immunity, I may cite Algerian sheep, which are refractory to anthrax, when inoculated in the usual way; but prove susceptible to it when the dose of the virus is largely increased.

Dogs rarely contract tetanus; horses, on the other hand, are very susceptible to it.

On page 125, I allude to the accidental immunity of the carnivora from actinomycosis.

The immunity of fowl against anthrax appears to be due to their high internal temperature (107.5° F.); for Pasteur has proved that if a fowl be inoculated with anthrax, and is then placed and kept in water at a temperature of 77° F., so as to considerably reduce its internal heat, it will die of anthrax in about a day and a half.

The nature of the lesions set up in the tissues by certain diseases, greatly affects comparative resistance. Thus, in a man who has been inoculated with anthrax, the virus is more or less arrested at the seat of inoculation in the malignant pustule which forms at that spot; but in the horse it spreads, apparently unchecked, throughout his entire body. Hence, anthrax is far more fatal, and runs a much more rapid course in horses than in men.

In those diseases in which one attack has a well-marked power of conferring subsequent immunity, protection, according to Metchnikoff, is acquired by the previous training in devouring microbes which the leucocytes have undergone. "If we inoculate the virus of anthrax, for example, under the skin of an ordinary rabbit and of a rabbit which has been protected by vaccination, behold what we may observe at the respective seats of inoculation. In the ordinary rabbit, the microbes multiply rapidly. The swollen part is full of watery fluid, and is poor in cells. Little by little the swelling

extends; the neighbouring ganglions enlarge; and the infection becomes generalised. In the protected rabbit, on the contrary, the bacilli multiply at first; but soon the leucocytes arrive in such great numbers, that the microbes are taken and killed; the fluid in the swelling, instead of being clear, becomes thick, cells are abundant it it, the bacilli disappear, the disease does not extend, and it becomes cured " (*Cadéac*).

Immunity may be acquired by the paralysing influence which the material formed in the tissues by the disease germs, has on these microbes. Bouchard has proved this in the cultivation of the bacillus of blue pus, and Raulin in that of the aspergillus niger. As a familiar instance, Cadéac cites the experiment of putting yeast in a solution of sugar, which mixture will produce carbonic acid and alcohol. After a certain time the fermentation will stop. If we add sugar to the liquid, the yeast will recommence growing; but the fermentation will soon again stop, and will not begin afresh even if we add more sugar. If on the contrary, we add water, the fermentation will commence again; and will also do so, if by heating the liquid, we drive off the alcohol which has been formed. In the first case, the effect of the water was not to add to the materials necessary for the nutrition of the ferment, but to dilute the matters formed by the yeast, of which alcohol was the principal. In the second case, the heat expelled the alcohol or considerably diminished it, and the fermentation commenced anew. Here, the alcohol has a poisonous or paralysing effect on the yeast which produced it. This theory may serve to explain the fact that certain diseases, like contagious pleuro-pneumonia and pink-eye (influenza), run a definite course, at the end of which, if the animal has survived the severity of the symptons, the disease will disappear. In this class of diseases, the acquired immunity will naturally be comparatively short-lived. The material which Pasteur employed for innoculation as a preventive to rabies, and which is obtained from the spinal cord of rabid rabbits, may act in the same manner, by checking the development of the microbe that is supposed to produce rabies.

Behring and Kitasato have shown that the serum (the watery portion of the blood) of animals which have had respectively diphtheria or tetanus, and the serum of animals which are immune to these respective diseases, are antidotes to these complaints.

In seeking for an explanation of this phenomenon, we naturally turn to the fact that the microbes of diphtheria, tetanus, glanders, and other diseases act injuriously on the system of an affected animal by means of the poisons (*toxins*) which they or their respective ferments manufacture in the animal body. These toxins are chemical poisons of extreme virulence: for instance, two drops of tetanus toxin will kill a horse. Behring and Kitasato argued that the immune serum produces its effect by reason of its containing a substance *(anti-toxin)* which has the power of neutralising or rendering inert its respective toxin, probably by combining chemically with it. Roux, however, has shown that, although a mixture of tetanus toxin (for example) and immune serum, on being injected, produces no ill effects on a healthy animal; it causes the death by tetanus of animals whose systems are under the influence of certain microbic diseases, such as strangles, which, it is almost needless to say, diminish the resistance of the tissues. Further, we have the theory that immune serum produces its protective effect by stimulating the system to resist the action of the toxin. In accordance with this view, we have the fact (p. 15) that in inflammation, the leucocytes and cells of an injured part absorb and digest dead and effete matter. Metchnikoff has also proved that the leucocytes and cells of the tissues, both of which he classes under the heading of *phagocytes*, perform a like office in contagious diseases by absorbing into their substance, and by digesting, the attacking microbes. Here we again return to Metchnikoff's idea of protection being obtained by the training of the phagocytes. Calmette has made animals immune from the bites of certain poisonous snakes by repeated injections of the venom, in, at first, small (non-lethal) doses which were gradually increased, without injuriously affecting the patient, to many times

2*

the quantity capable of killing under normal circumstances. He further found that the serum of the blood of an immunised animal was a powerful antidote to the poison of the snakes by whose means immunity was obtained.

Roux, in experimenting with snake poison, has proved that the supposed anti-toxin does not destroy it; although it undoubtedly neutralises it. Taking advantage of the fact that a temperature of 154.4° F. (68° C.) causes the immune serum to lose its protective properties, but has no influence in diminishing the virulence of snake poison, he mixed a lethal dose of snake poison with a fully protective quantity of serum, and after having heated the mixture to 68° C., he injected it into rabbits, with the result that these animals died of snake poisoning in the same manner as they would have done had the serum been omitted. When, however, the mixture had not been heated, its injection proved harmless.

It appears to have been assumed by Calmette that his serum was capable of affording immunity from the injurious consequences of the bites of all snakes. Dr. C. J. Martin, who made many experiments with Calmette's serum in Australia, proved, that although it had a strong curative effect on the venom of cobras, it had very little influence on that of Australian tiger snakes. In explanation of this fact he showed that snake poison contains two or more toxins which vary in the proportions they bear to each other, according to the variety of the snake; and that the chief toxin of cobra venom is found only in very small quantities in Australian tiger snake venom. Hence, the non-success of Calmette's serum in Australia.

Immunity can be also obtained against certain diseases, tetanus, for instance, by commencing with injections of pure toxin much below the lethal quantity, and gradually increasing the dose, or by using injections, in the same manner, of attenuated toxin, the attenuation being effected by heat or by the addition of chemical agents. Thus, in rabies, the attenuated virus or toxin is successfully employed as a preventive vaccine; in other words, the inoculated animals acquire immunity.

Recent researches conclusively prove the existence of antitoxins in the blood, spleen, and other glands of immune animals; and that these antitoxins are manufactured by the tissues—probably, for the most part, by the glands. Hence, the addition to the blood of serum containing an antitoxin, may act as a reinforcement to the antitoxin secreted by the tissues. It appears that the presence of a toxin in the blood stimulates the tissues to form an antitoxin. Consequently, the healthier are the tissues, the better able are they to produce an antidote to the poison. We here arrive at the apparently sound theory that, in many cases, acquired immunity is dependent on developing the power of the tissues to secrete antitoxins.

The frequently successful resistance which the healthy body makes to attacks of infective diseases, gives us strong grounds for assuming that the production of one or more antitoxins is a normal function of its tissues; a view which has been borne out by the experiments of Dr. Marriatti-Bianchi. Roux and Calmette have also shown that rabbits which have been made immune from rabies, have greatly increased power of resisting the action of cobra venom, and that the serum of animals which have been rendered respectively immune from tetanus and anthrax, have a strong counteracting effect on the venom of this snake. Hence, the neutralising power of an antitoxin is not always restricted to its own particular toxin.

Disease-producing bacteria elaborate not only one or more special toxins, but also form products which give rise to fever, by their action on the heat-regulating centres of the brain.

Heredity.

Heredity is the appearance, in descendants, of "like" of parents or of ancestors. This production of "like" is limited to parental or ancestral function, and, consequently, cannot begin after conception. Heredity in

disease is manifested by parental or ancestral tendency or by direct transmission from a parent.

HEREDITARY TENDENCY.—The ovum of the female on being fecundated by a spermatozoon of the male, becomes a living being gifted with the mental and physical properties of both its parents, in varying proportions, and consequently contains those of its paternal and maternal ancestors in proportions which, as a rule, decrease more or less according to the remoteness of the relationship. These hereditary properties, even when decreased to an extremely small fraction by the successive division of generations, are capable of becoming stimulated into development by surroundings or by forces unknown to us. Thus, after a period of possibly 500,000 generations, a single-toed mare gives birth to a foal which has one or more feet resembling those of its three-toed ancestor (see "Points of the Horse"). Under ordinary circumstances, the nearer the ancestor, the stronger is the influence of heredity; although in no case (speaking within reasonable limits) can such influence be entirely effaced. The more nearly related dam and sire are, the larger is the proportion, in the offspring, of properties which they both derive from a common parent or ancestor. Hence, consanguinity is a fruitful cause of excessively developed hereditary defects and hereditary tendencies to disease. The union of a brother and sister would be twice as close a case of incest, as one between a parent and its offspring.

Acquired characteristics, as for instance, roaring, navicular disease, sidebones, spavin, and ringbone, are not hereditary; because these diseases could not be produced in a descendant without an exciting cause. Although the offspring of roarers, for example, are far more apt to become "musical" in England and other damp and comparatively cold climates, than their compatriots which are descended from sound-winded dams and sires; they hardly ever go wrong in their wind, if bred and reared in a dry hot climate, like that of India and South Africa. Here, the effect of heredity is confined to the transmission of predisposition.

DIRECT TRANSMISSION.—In some cases, the blood of the dam carries the microbes of infectious diseases, like anthrax, to the fœtus. "The researches made by M. Chauveau have shown that bacilli rarely pass from the mother to the fœtus. In eleven cases of pregnant ewes which had died from anthrax, the bacilli of this disease were found in only two of the fœti" (*Cadéac*). Such intra-uterine infection "may occur in man as well as in animals, but it is an infection, not an inheritance" *(Kanthack)*. This author tells us in Gibson's "Text Book of Medicine" that "as far as the mammalia are concerned, there is no evidence that an ovum is ever infected before or during conception."

HEREDITARY IMMUNITY.—It appears from the researches of Ehrlich, Vaillard, and others, that immunity against certain diseases, such as tetanus, may be conferred on the fœtus through the mother; but that no immunity is transmitted through the ovum of an immune mother or through the spermatozoon of the sire. Thus, if the mother be rendered immune before conception or before delivery, the offspring may, through the blood of the mother, acquire immunity, but only for a brief period. Here we have apparently the action of an antitoxin.

CHAPTER IV.

SPRAINS.

GENERAL REMARKS ON SPRAINS—SPRAIN OF THE SUSPENSORY LIGAMENT —SPRAIN OF THE BACK TENDONS AND CHECK LIGAMENT—SPRAIN OF THE FETLOCK JOINT—SPRAIN OF THE INFERIOR SESAMOID LIGAMENTS —TREATMENT OF SPRAINS BELOW KNEE AND HOCK—FILLED LEGS— CURB—SPRUNG HOCK—SPRAIN OF THE SHOULDER—SPRAINS OF THE ELBOW AND HIP—SPRAINED BACK—LEGAL ASPECT OF SPRAIN.

General Remarks on Sprains.

DEFINITION OF SPRAIN.—A sprain is an injury to ligament, tendon, joint, or muscle, caused by an excessive pull or twist, or by the repeated application of such injurious force, with the result that the fibres of the part are more or less broken, over-stretched, or torn away from the bones or other structures to which they were attached.

The study of sprains is very important; for they probably constitute nine-tenths of the injuries which unfit saddle-horses for work.

STRUCTURES LIABLE TO SPRAIN.—The *ligaments* which are specially exposed to this accident, are composed of strong, inelastic tissue; their office being to bind together various structures. Thus, in the knee there are two lateral ligaments, which are fixed, one on each side of the joint, to the ends of the bones, immediately above and below it, so as to prevent it from having side play. Capsular ligaments cover the joints and protect them from injury. The suspensory ligament (Figs. 5 and 6) aids in preventing the fetlock from coming down on the ground when the horse puts weight on the foot. *Tendons* (sinews) are composed of the same kind of material as the ligaments just mentioned, and serve the part of strong inelastic cords to connect muscles to bones. A tendon, at one end, is spliced on to its muscle; and at the other end, is attached to the surface of the bone. *Muscles*, which compose the lean of meat, give rise to the movements of the body by their power of contraction. Thus, before the foot can be raised—speaking in general terms—the muscles which are connected at one end to the bone of the leg, just above and at the back of the elbow, and at the other end to the back tendons, will have to contract on being stimulated by their nerves, so that the foot, which is attached to the lower end of the back tendons, gets forcibly pulled up. When the stimulus ceases to act, the muscles relax, and the foot again comes to the ground.

NATURE OF SPRAIN.—Ligaments, as well as tendons, may break right across; or "they may tear, especially small portions of them, here and there, so that the whole thickness is not broken across at any one spot; but they will not stretch. It is true that under certain conditions they do become elongated, but this only happens when the strain is continuous, and lasts for some considerable time. A slight degree of inflammation sets in then, and under its influence the fibrils soften, until they yield. Sometimes ligaments give way in the middle, but it is more common for them to separate from the bone, or to wrench from it a small thin scale corresponding to their attachment. This is due in part to the arrangement of their fibres. In the centre they are woven strongly together, and form a rounded bundle of great strength. At the end they spread out like a fan, so as to secure a wider attachment. A ligament that can resist successfully a straight pull of great violence, yields at once to a twisting force of much less severity; because this pulls on the fibres unequally, one by one, and tears them from their attachment" (*Moullin*). The fibres of muscles may also become more or less torn from sprain.

In a sprained tissue, there is not only an inflammatory exudation (p. 14) as a result of the injury; but there is also, as a rule, extravasated blood, that is, blood which has escaped from vessels that were ruptured at the same time as the broken fibres. In human practice, discoloration of the affected tissues in the case, say, of a badly sprained ankle, often proves the presence in them of extravasated blood, which is visible on account of the thinness and translucency of the skin. As a rule, the horse's skin is too thick and too full of pigment to allow of the discoloration in question to be seen through it.

HOW SPRAINS OCCUR.—In the very common case of lameness due to an acutely swollen fetlock, caused, particularly, by fast work on hard ground, and occurring, usually, to horses with comparatively straight pasterns, we have a good instance of sprain of ligament, brought on by continued and excessive pressure from the presence, in the part, of the fluids which give rise to the swelling. Concussion here appears to be the exciting cause.

In many cases sprains occur only by accident—such as a sudden twist at a moment when the muscles are unable to act quick enough to save the part—or when the muscles have become so fatigued that they are, in this instance also, powerless to preserve its stability. The practical inferences are obvious.

Experienced horsemen will, I think, agree with me that sprains of the tendons and ligaments of the fore legs—which are the most common accidents to which horses employed in fast work are liable—come on, as a rule, gradually, and as a result of the injured structures having become abnormally weak. The history of the case is usually as follows:—On previous occasions after exercise, heat and tenderness were observed in the part, which symptoms more or less subsided by a short rest having been given, and by the aid of the ordinary remedies, so that the horse was enabled to continue work, off and on, until the day on which the final accident occurred; or, in other words, until the part, on account of the presence of continued inflammation, or continued tension, became too weak to stand the strain of its ordinary work, or of work which would have been well within its power had it been in a

healthy condition. Horses out of work are much more liable to sprain than those which are " fit and well ; " for the more a healthy part is exercised, short of injuring it, the more blood is brought to it, and consequently, the stronger it becomes. But if exercise be curtailed, any violent or unaccustomed exertion will be liable to injuriously affect it.

Unprincipled persons wanting to sell a horse with a thickened tendon or ligament, sometimes try to make out that the leg is as sound as when the animal was foaled, on the plea that the part has become "callous," an expression which the buyer should understand to mean " incurably weak ; " for here we have, as a rule, a stage long past that in which repair is possible.

PRINCIPLES OF TREATMENT.—In the case of sprain, were there but little extravasated blood and exuded plasma—the continued presence of which fluids, as we have seen, renders the part weak and stiff by interfering with the circulation and by giving rise to adhesions—the broken fibres would unite as completely, other things being equal, as the ends of a bone, in the case of a simple fracture. Hence, our first efforts should be directed to check the accumulation, in the part, of these fluids, and to hasten their removal from it. The two most important factors in the treatment of sprain, are *massage* and well-regulated *pressure* (page 45). Above all things, the pressure should be uniformly distributed, because unequally distributed pressure is almost certain to cause irritation, if not inflammation, of the part, in either of which cases, the sprain will be aggravated. By the usual method of employing pressure, say, on a fetlock by means of an ordinary bandage, we succeed in applying it only on bony prominences, and not on the soft parts which specially require it. When bandaging, in the same way, a leg between the knee or hock and fetlock, the effect obtained is merely to push the suspensory ligament against the cannon bone, without also (as we ought to do) putting pressure on each side of it. By employing, on the contrary, the method of evenly distributed pressure described on page 45, these faults are obviated.

As subjecting the already weakened part to strain, would be liable to give rise to fresh injury ; rest from all severe exercise is a necessity. As soon, however, as the heat and tenderness have subsided, and lameness at a walk has disappeared, we may begin to give our patient, two or three times a day, a little very gentle exercise ; for long continued inaction after sprain is certain to be followed by the formation of adhesions.

Massage or hand-rubbing (p. 664) should be used after a sprain, as soon as it can be employed without inflicting pain. Its benefits appear to be due chiefly to pressure ; to the fact of its stimulating the action of the blood-vessels which are near the surface of the body ; and to its mechanical effect in quickening the circulation of the lymphatics. The marked increase of temperature from hand-rubbing, is a convincing proof of its stimulating power on the blood-vessels.

Passive exercise, which, in the case of a limb, may be obtained by gently bending and straightening the joints, with the foot off the ground and the animal standing still, should be carried out, after the first day or two, a couple of times a day, in order to prevent the formation of adhesions.

Purgatives act beneficially by diminishing the congestion of the blood-vessels, in that they remove from them a large quantity of watery fluid.

Drinking water should be allowed in a full supply, in order that the blood may be kept in a sufficiently fluid state for the due performance of its functions. There is no danger of the horse drinking too much ; for any surplus will be quickly excreted by the kidneys, lungs, skin, &c.

Diuretics (nitre, for instance), purify the blood by stimulating the kidneys, the office of which is to remove waste material from the blood along with the urine; but as their continued use has a bad effect on the kidneys and general health, they should be employed only for a day or two, in the event of the patient being in gross condition.

Laxative food (green fodder, carrots, &c.) has a "cooling" effect by acting on the bowels; by being poor in substances, such as albumin, which is apt to "heat" the system; and by reason of its containing certain salts which, on becoming absorbed into the blood, assist in maintaining its fluidity, and in removing waste material.

Starvation within healthy limits, as we may see from the foregoing remarks, may be enforced with advantage in the acute stage of sprain.

Belladonna, as an external application, relieves congestion by stimulating the superficial blood vessels.

Heat applied in the form of warm water to a bleeding surface helps to check hæmorrhage, and consequently may be useful in the very early stage of a sprain, when the ruptured blood-vessels are still bleeding. Its temperature should be from 120° to 125° F. A few minutes will suffice to produce the desired effect. The application of warm water is useful only when the injured part is near the surface; for it could have little or no effect if the site of hurt were deep-seated. If long continued, it would act injuriously; for by softening the tissues, it would increase the amount of the exudation. Its beneficial effect is generally more apparent than real, on account of its acting as a sedative in relieving pain.

Cold (by means of water, ice, or refrigerant lotions, for instance) causes contraction of the tissues, and by the pressure thereby obtained, checks the flow of an exudation from the capillaries (p. 10). As its employment tends to arrest all vital action (that of repair among the number); it can hardly be expected to effect much benefit in acute inflammation. Although the application of hot or cold water, when used sufficiently early, to sprains, possesses certain merits; the advantages to be obtained from it are so small, as compared to those of evenly distributed pressure and massage, that, as a general rule, we may discard its use in the treatment of sprains.

Active *exercise* of a very moderate description, and judiciously regulated, should, as I have already said, be given comparatively early. It should of course be of a nature that would in no way be liable to cause a recurrence of the acute symptoms. If a swollen limb which, after exercise, keeps "fine" for a few hours, only to get subsequently as big or bigger than before, the exercise will do little or no good, and may be hurtful, the best means of avoiding which contingency are massage (p. 664) and properly distributed pressure (as with cotton wadding, see page 45).

Counter-Irritants.—The application of any form of irritation—whether by embrocation, blister or firing—on the surface of a sprained part, by diminishing the tenseness of the tissues (p. 14), must increase the inflammation. I have invariably found that the premature blistering of a sprained part below knee or hock, is followed by permanent thickening and consequent weakness. I take sprains below the knee and hock as an illustration, because their progress can be followed out with comparative ease, owing to the superficial position of the affected structures. In every case of uncomplicated sprain, I would certainly refrain from applying a counter irritant until all heat and pain have disappeared from the part. With respect to the treatment of sprain when complicated by inflammation of bone, see page 52 *et seq.*

Many people think that the peeling off of the scab after a blister is a proof that benefit has been effected by the application—as if the swollen part were composed of layers like those of an onion! If we examine the condition of skin which has been severely blistered on one or more occasions (as we may observe on cutting through the skin before performing neurotomy), we shall

find that the skin has become greatly thickened, and that it must necessarily form a permanent bandage, in accomplishing which office, the benefit to be derived from a blister appears to chiefly consist. I never employ a blister to sprains below the knee and hock; because I find that I get better results by pressure (p. 45), and hand-rubbing (p. 664), and without thickening of the skin, which is a condition that must more or less impede motion, and may give rise to adhesions. The effects of pressure can be stopped, at any moment, by removing the bandage; but those of a blister cause permanent structural alterations which may or may not be beneficial. In sprains of parts, like the shoulder, stifle, and back, to which we cannot conveniently apply pressure, we should rely chiefly on hand-rubbing (massage).

Firing (p. 662) is said, by some authorities, to produce a good effect in old cases of sprains which have resisted other remedies. It affords permanent pressure on the part, by causing contraction. The portion of skin that has been burned by the firing iron becomes replaced by fibrous tissue, the property of which is to contract, as we may see exemplified by the "drawn" appearance of the skin of a person's neck or cheek which has healed after having suffered from a severe burn. Some of the benefit obtained in many instances from firing is undoubtedly due to the absence from severe work which it necessitates. Firing is a most valuable stimulant in hastening the completion of inflammation in bone.

GENERAL TREATMENT OF SPRAINS.—We should give rest, as quickly and as completely as possible, to the affected part. If the injury is in one of the legs, and the animal cannot bring the heel to the ground, we should apply a high-heeled shoe, like that shown in Fig. 4. This pattern is very easy to make, it affords a firm bearing to the foot, and has the great advantage that its heels can be lowered from time to time with very little trouble. A high-heeled shoe should of course be employed only in those cases to which relief is given by allowing a bearing to the heel while it is raised off the ground. If it is not convenient or suitable to put on this kind of shoe, a full supply of sawdust or similar material should, if obtainable, be substituted for the ordinary straw bedding, as the animal will be able to assume an easier position for his sore leg on the former than on the latter. Care should be taken that the sound limb is not injured by undue weight being thrown on it, by reason of the precautions adopted to place the hurt leg at rest. As a rule, the use of slings (p. 680) is not advisable in such cases, as their presence is apt to cause sores, to interfere with staling and digestion, and to irritate the animal. They may be necessary in severe lameness of a hind limb, because, when thus affected, a horse will rarely lie down.

If practicable, we should lose no time in applying pressure of a thoroughly uniform nature (p. 45), and in all cases, we should avail ourselves of the good effects of massage (p. 664).

When we have a severe sprain in a horse which is "full of corn," it is well to give a dose of physic (preferably, eserine, p. 609), after clearing out the lower part of the bowel with an enema or two.

Laxative food, such as green grass, lucerne, carrots, bran and

linseed mashes, should be given instead of corn. Mashes should be used only when green food cannot be obtained. A judicious amount of starving will, as a rule, act beneficially.

In hand-rubbing the part, care must be taken that the skin is dry at the time; for if this precaution be not observed, the friction may cause the hair to come off.

When uniform and well-regulated pressure can be applied to the

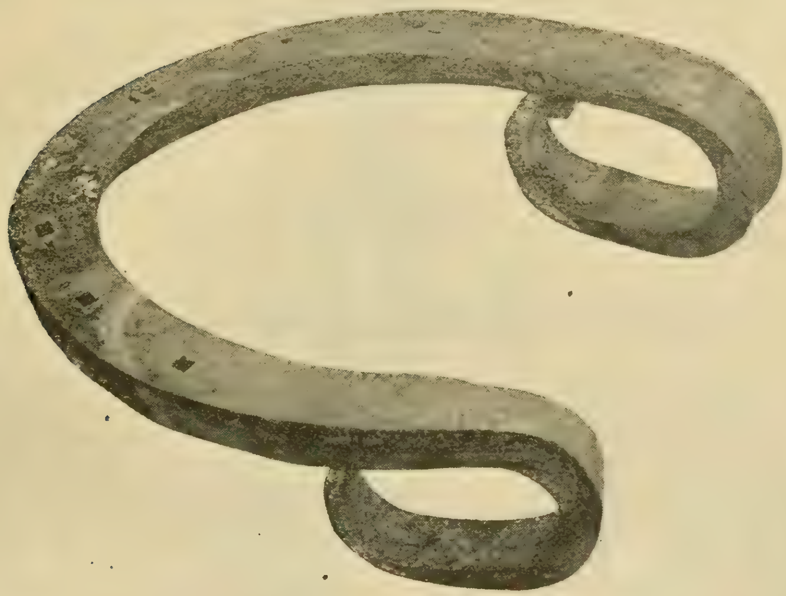


Fig. 4.—High-heeled shoe.

part, I think it best to trust to it and hand-rubbing alone. At the same time, I must admit that many experienced veterinary surgeons are partial to the employment of cold water, after the disappearance of all pain and unusual heat, in order to give tone to the injured structures. It can be applied by a jet from a hose, which may be allowed to play on the part for, say a quarter of an hour, four or five times a day. In India, we may substitute for the hose a water-skin, the water in which can be cooled by placing it in the shade for some time, exposed to the wind. Standing the horse in a running stream for considerable periods, or, better still, walking him through salt water, often proves beneficial, care being taken that he does not catch cold.

If all our efforts prove unavailing to render the part sound, we may fire deeply, either by puncture or line; but should do so only when all reparative action has apparently ceased, say, not sooner than two months after the accident. If any heat remains, the part should be cooled down by means of cold applications before using the firing iron.

After the part has recovered from the injury as far as circumstances admit, the owner can exercise his own judgment in bringing the horse on to work again, giving corn, using bandages, etc. I shall refer to this subject more fully on pages 44 *et seq.*

It is important to remember that the gravity of a sprain is largely dependent on the conformation of the leg; for the stronger a part naturally is, the more likely is it to recover from injury.

On the Continent, sprains (for instance, of the shoulder and back tendons) have been successfully treated by means of subcutaneous injections (p. 633) of from 1 to $1\frac{1}{2}$ drachms of oil of turpentine, which sets up intense inflammation in the part; but the heat and swelling usually begin to subside in about a week.

Sprain of the Suspensory Ligament.

ANATOMY OF THE SUSPENSORY LIGAMENT.—The suspensory ligament (Figs. 5 and 6) is a strong and practically inelastic fibrous cord which lies at the back of, and close to, the cannon bone. It originates at the head of the cannon bone and at the lower row of the small bones of the knee (Fig. 8). It runs down the groove formed by the two splint bones, for about two-thirds of the length of the cannon bone, then divides into two branches, which become attached to the summits of the sesamoid bones—that lie at the back of the fetlock joint (Fig. 9)—and extend downwards and forwards. These branches unite in front of and at about the middle of the pastern, and become attached to the tendon of the muscle which extends the foot (Fig. 7).

The presence of muscular fibres in the suspensory ligament points to the fact of its possessing a certain, though probably very slight, amount of elasticity. The suspensory ligament acts as a powerful brace for preventing the fetlock from coming down too near the ground.

THE SUSPENSORY LIGAMENT IN HEALTH.—On taking a side-view of a "clean" leg of a horse (vide Frontispiece), we ought to see the suspensory ligament rising just above the fetlock joint, between the cannon bone and back tendons, and extending nearly two-thirds of the way up to the knee. The skin should cover it closely, and it should stand clear and well-defined between bone and tendon, as if it were cast in a mould, so that the leg, from knee to fetlock, will have a fluted appearance. When there is difficulty in marking the course of this ligament with the eye or with the hand, according as the leg is free from long hair, or is "well feathered," we may doubt the capability of the leg for standing continued fast work.

When the suspensory ligament is in a sound condition, it will feel, if we run our hand over it, when the foot is on the ground, hard and tense like a tightly-strung violin string. If its strength has been impaired by a sprain, it will feel comparatively soft, and will convey the impression that it has lost to some extent its fibrous character. In case of doubt, a comparison with a leg which

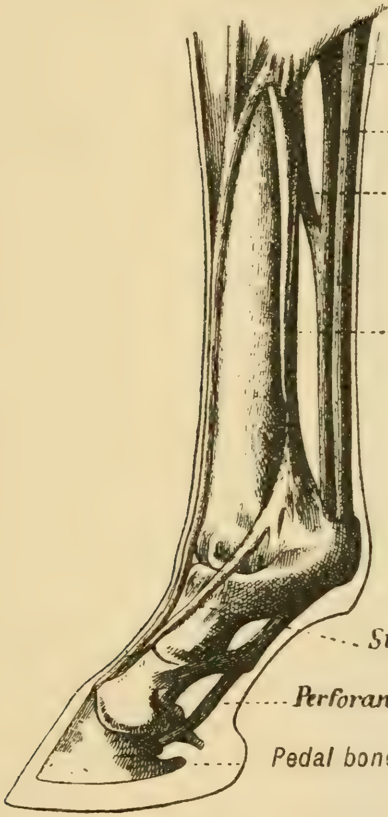


Fig. 5.—Diagram of bones, tendons, and ligaments of near fore leg.

we know to be sound will greatly help us in drawing a correct conclusion.

The tendons and ligaments of some legs, particularly those of underbred horses, are, however, often covered with an unusually large amount of loose tissue, which causes the legs to have a more or less "filled" appearance, though without affecting their capacity for standing work. The apparent "cleanness" due to absorption consequent on old age, which many stale worn-out legs exhibit,

should not be mistaken for strength and freshness. The condition of the knees and fetlocks will aid the observer in forming a correct judgment on such cases. The knees show the effects of work by being bowed and shaky; the fetlocks, by being round and puffy; and the pasterns, as a rule, by being abnormally upright.

Horses are peculiarly liable to sprain their suspensory ligaments at the gallop.

MANNER IN WHICH THE SUSPENSORY LIGAMENT GETS SPRAINED IN GALLOPING.—The gallop is a pace of four time in which the sequence of the steps (supposing the off fore to lead) is near hind, off hind, near fore, off fore, with a period of suspension, which is terminated by the near hind again coming to the ground. In the gallop and canter (Figs. 10, 11, 12 and 13), the leading fore leg has at each stride to bear the weight of the body, and, by the straightening out of its component bones, to raise it from the ground. Here, the suspensory ligament performs the passive action of supporting the fetlock joint. As long as the horse is untired, the muscles to which the back tendons are attached, contract with such precision that the foot is "picked up" (flexed) before undue strain can fall on the suspensory ligament; in fact, these tendons act as braces to it. But if the movement be continued, the horse will "dwell" more and more in his stride, until the flexor muscles, having become fatigued, may at length be unable to contract with sufficient quickness to save the suspensory ligament from undue tension. Besides, though the muscles get tired, the ligament does not experience the sensation of fatigue; hence, towards the end of a tiring gallop, the horse will throw increased weight on the ligament, in order to save the muscles. We can easily imagine how great the strain on the suspensory ligament must be in the case of a racehorse struggling home during a desperate finish. No wonder then that these animals, when they break down, generally do so in the last furlong, especially if the ligament has been previously injured. We can also see why they are more apt to break down, when short of work, than when in good condition.

A striking proof that as long as horses do not become fatigued, they will not be liable to sprain their suspensory ligaments or back tendons, is afforded by the fact that animals which have been rendered totally unfit for the turf on account of one of these accidents, often make serviceable chargers for ordinary parades, on which a gallop is seldom required to be made beyond a few hundred yards, and is executed in a well-collected style.

The study of the gallop teaches us, among other things, the fol-

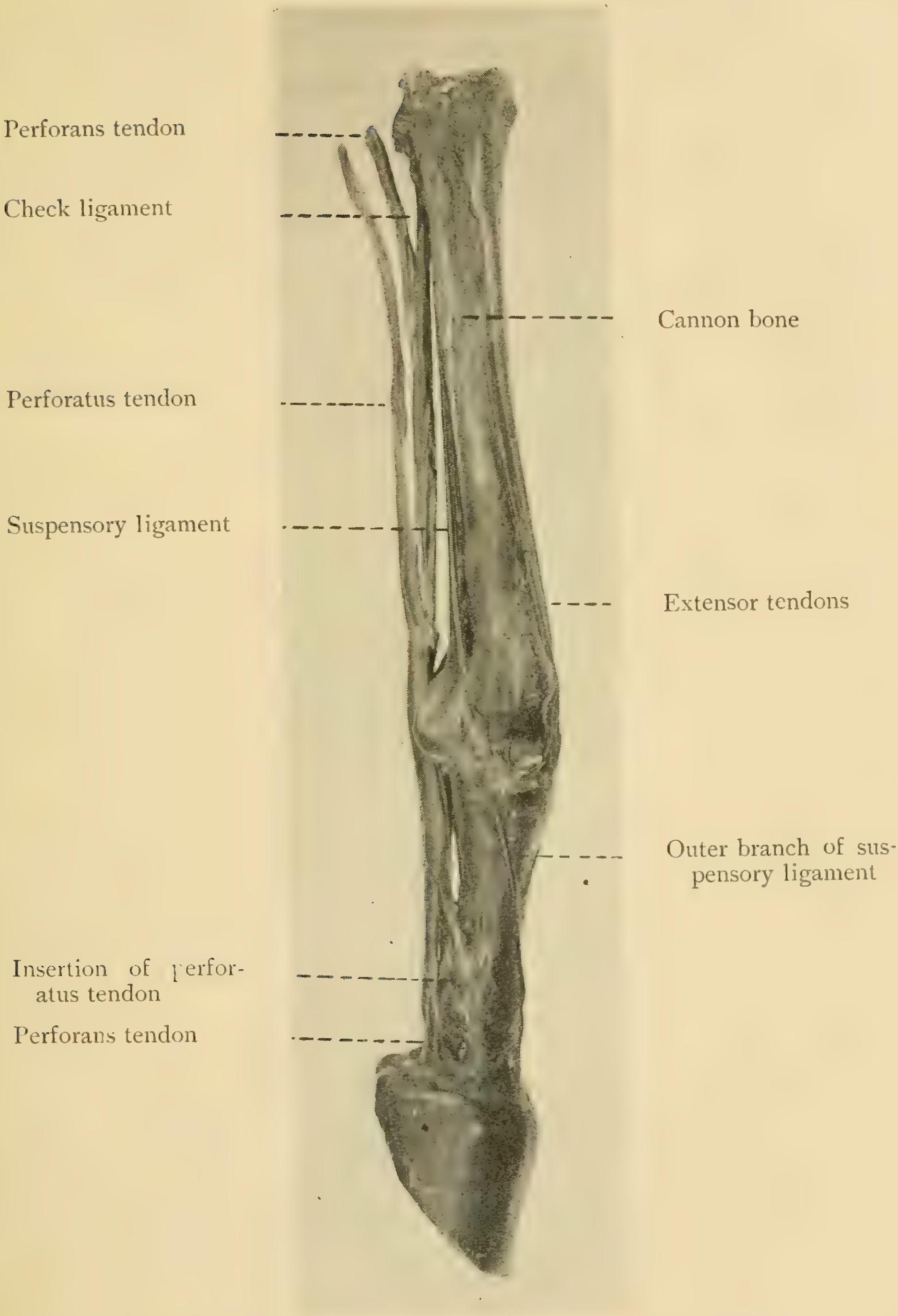


Fig. 6.—Photograph of bones, tendons and ligaments of off fore leg (side view).

lowing lessons with respect to sprain of the suspensory ligament and back tendons:—

1. The leading fore leg is far more liable to these accidents than the non-leading fore leg. Hence, in order to keep our saddle-horses sound as long as possible, we should accustom them to lead with one fore leg, as much as with the other fore leg.

2. In giving work at the gallop or canter to horses which have a fore leg that has been rendered more or less infirm from sprain, we should teach them to lead with the sound one. Or we should give as much of the work as we can at the trot, at which pace the weight of the body is alternately supported by the near fore and off hind, and by the off fore and near hind.

3. The steeper the ascent upon which work is given to horses, the less strain will there be put on the back tendons and suspensory ligaments of their fore legs; and *vice versâ.*

4. The faster the speed, the more strain will be thrown on the tendons and ligaments.

5. The more a horse is "collected," the less strain will there be on the fore legs; and the more, on the hind legs.

6. In training racehorses with weak suspensory ligaments or infirm back tendons, the only safe method for giving them fast work is by short and repeated gallops. For instance, instead of sending such a horse a mile gallop, we might give him three "spins" of three furlongs each, with intervals of from a quarter to half an hour, in order to allow the muscles to recover their strength and tone.

I think we may take for granted the existence of more or less perfect harmony between the strength of the muscles, respectively, of the fore and hind limbs, and that, if a horse were turned loose and allowed to gallop at his own free will, the muscles of the hind legs would become fatigued as soon, or nearly as soon, as would those of the fore. Here, the diminished assistance which is afforded by the back tendons to the suspensory ligaments in the fore legs, would, when their muscles became tired, be compensated for by the decreased propulsion given by the hind quarters. But if we put a rider into the saddle, this harmony is at once destroyed; for then, the weight being brought forward by the position assumed in riding, the muscles connected with the back tendons of the fore legs will have more work to do, proportionately, than the muscles of the hind legs, and will consequently become more quickly fatigued. The opposite to this is often the case with troop horses, which, being ridden on the curb, and being kept up to the bit by the pressure of the legs, are apt to relieve the forehand at the expense of the hocks.

The harder the ground upon which a horse is worked, the more

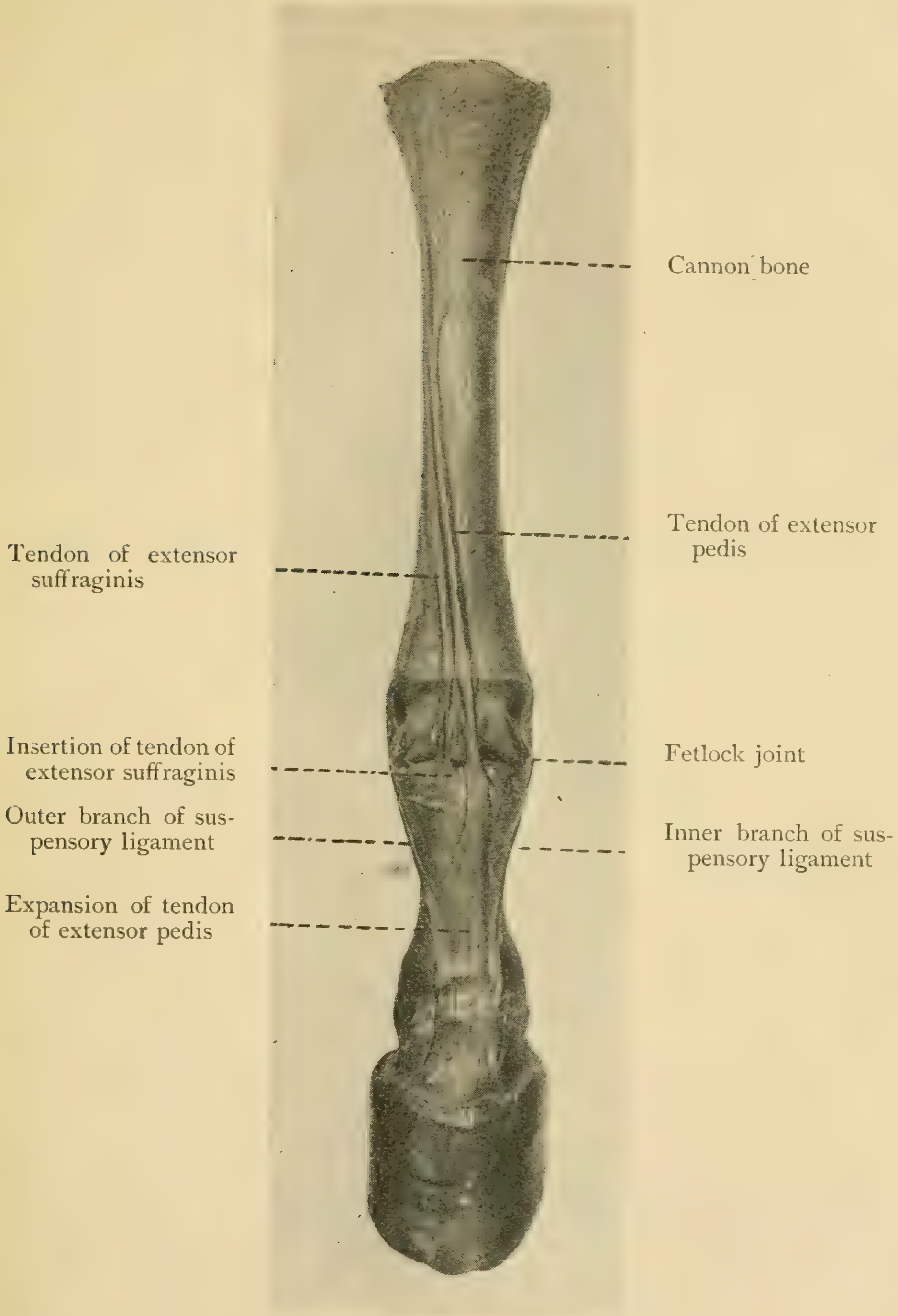


Fig. 7.—Photograph of bones, tendons and ligaments of off fore leg (front view).

suddenly does weight fall on the suspensory ligament, and the more difficult becomes the task of the back tendons to save it from undue strain. Hence, the well-known danger of inducing sprain of the suspensory ligament by galloping on hard ground.

The longer and more oblique the pasterns are, the more gradually does the strain of work fall on the suspensory ligament, and the longer time is given to the back tendons to contract, and thus to relieve it from excessive tension. Consequently we find in India, where the "going" is very hard, that oblique pasterns are indispensable for horses which have to do fast work in that country. The mechanical disadvantage entailed on the working of the back tendons by obliquity of pastern is, under such conditions, more than compensated for by the comparative immunity from injury thereby conferred on the suspensory ligaments. When the ground is soft and level, or inclined upwards to the front, the balance is in favour of the more upright form of pastern, which is particularly bad in going down hill; for the steeper the descent, the greater is the proportion of weight which the forehand has to support. This fact is well understood by racing men, who always entertain great prejudice against the chances of success possessed by a horse with upright pasterns, when he has to compete in a race, a considerable portion of which is down a steep incline, like at Epsom.

As the proportion of weight normally borne by the fore legs of a saddle-horse, especially when mounted, is greater than that supported by the hind ones, and as it increases directly as the speed; sprain of the suspensory ligaments is in the large majority of cases confined to the fore legs. I have, however, met with some well-marked instances of sprain of the suspensory ligaments, and also of the back tendons of the hind legs, in hunters, from the use of severe bits and from the practice of keeping too tight a hold of the reins when jumping; the consequence being that such animals on landing over a fence put an undue amount of weight on their hind legs, in order to "save" their mouths.

Both from theoretical considerations, and from practical observations, I think we may assume that the suspensory ligaments of a saddle-horse do not, as a rule, get sprained even at fast paces, except when the animal becomes fatigued; when he is worked on hard ground; or when the severity of the bit, or the mismanagement of the reins by the rider, prevents him from placing the proper proportion of weight on his forehand in jumping. The exceptions will probably be cases in which undue or unexpected strain takes place from the horse treading on some inequality or from landing on hard ground when leaping. The lessons to be drawn from these remarks are too obvious to need being detailed.

MANNER IN WHICH THE SUSPENSORY LIGAMENTS OF CART-HORSES GET SPRAINED.—When sprain of a suspensory ligament occurs in cart-horses, it is usually in the hind legs, and is due to extreme extension of the foot, as when going down hill with a heavy weight behind. Consequently it occurs less frequently

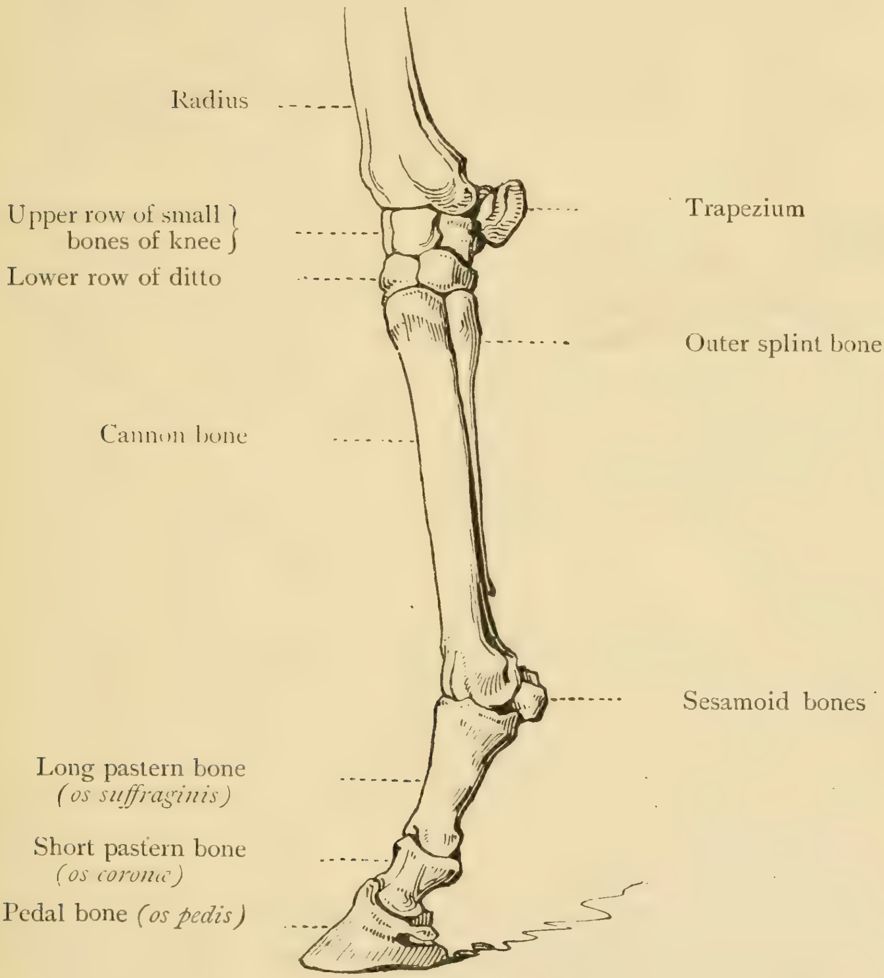


Fig. 8.—Bones of lower part of fore leg. (*After Chauveau.*)

when drawing four-wheeled carts which have a brake, than with two-wheeled carts, the load of which, when going down hill, has to be kept back by the breeching. Cart-horses with oblique hind pasterns appear to be more liable to this injury, than those of a different conformation. Here we have the ill effects of a mechanical disadvantage.

In all horses, sprain of the suspensory ligament may occur when getting up off a slippery floor, on account of excessive extension

of the fetlock joints, when the fore legs are stretched out to the front, with the heels resting on the ground.

SEAT OF SPRAIN OF THE SUSPENSORY LIGAMENT.—From mechanical considerations, the suspensory ligament appears most liable to be sprained at the points where it is attached to bones. It is connected, as we have seen on page 28, at its upper end, to the back of the head of the cannon bone, and lower row of the small bones of the knee, and, lower down, to the sesamoid bones. Its lower attachment is manifestly more liable to sprain than the upper attachment, because before arriving at the sesamoid bones, it divides into two branches, an outer and an inner, which become respectively fixed to the outer and inner sesamoid bones. In comparatively rare cases, the sprain takes place at the upper attachment, namely, immediately below the back of the knee, with or without implication of the lower row of the bones of the knee. Agreeably to the remarks made on page 23, we find that the effect of the force causing the sprain is, as a rule, manifested at the point of attachment of the ligament to the bone, with more or less consequent inflammation being set up in the bone (p. 230). The bony deposit at the back of the head of the cannon bone shown in Fig. 82 (p. 237) was evidently due to sprain which caused more or less extensive tearing-away of the fibres of the upper end of the suspensory ligament (or of the check ligament) from the bone to which they had been attached. Owing to the manner in which this particular seat of sprain is covered by the bones and ligaments of the knee and by the back tendons, the existence of sprain at that spot generally escapes notice, in that it is mistaken for some other ailment. As the check ligament (p. 37) has nearly the same attachment as the upper end of the suspensory ligament, it is almost impossible to say which structure is involved when sprain occurs at the spot in question.

SYMPTOMS OF SPRAIN OF THE SUSPENSORY LIGAMENT.—If the injury be but slight, although there may be some heat and swelling of the part, the horse may stand level and walk fairly well; but the lameness at the trot will be disproportionately great as compared to that at the walk. If the sprain be a severe one, there will be considerable lameness, the toe only being brought to the ground. When there is a very serious rupture of the lower end of the ligament, the fetlock pad comes down or nearly down to the ground. If only one branch of the ligament be severed, the descent of the fetlock pad will be less marked than when both are torn. Rupture of the suspensory ligament is termed a "break down."

Although, after rupture of the suspensory ligament, the obliquity of the pastern, when weight is put on the foot, will be greatly increased, owing to

the fetlock having lost the support of its powerful brace; the "bearing" of the foot will not be materially affected. Möller points out that when the perforans tendon has been ruptured, the toe will tend to point upwards if weight be put on the foot; the cause evidently being that the direction of the weight impressed on the limb falls behind the point of insertion of the perforans tendon on the base of the pedal bone. Hence, it appears that the toe of a sound horse is kept on the ground by the upward pull of the perforans tendon successfully antagonising the downward pressure of the weight borne by the limb.

TREATMENT FOR SPRAIN OF THE SUSPENSORY LIGAMENT.—See page 44 *et seq.*

Sprain of the Back Tendons and Check Ligament.

Anatomy of back tendons and check ligaments.—There are two back tendons (Figs. 5 and 6) which originate from muscles that help to raise the

Fig. 9.—Rear view of bones of fetlock and pastern. (*After Chauveau.*)

foot. From the knee, they run down behind the suspensory ligament, one overlying the other. The posterior tendon (the perforatus) forms a sheath for the passage of the other (the perforans) at the back of the fetlock joint, and becomes attached to the short pastern bone (Fig. 6). The perforans tendon is joined halfway down the cannon bone by a powerful ligament which originates at the head of that bone, and at the lower row of the small bones of the knee, having almost the same origin as the suspensory ligament (Fig. 6). This check ligament forms with the lower part of the perforans tendon a strong brace for preventing undue obliquity of the pastern; its office being very similar to, though less effective than, that of the suspensory ligament. The perforans tendon, after affording attachment to the check ligament, passes over the sesamoid bones, which act as a pulley for it, then down the back of the pastern bones, over the third sesamoid or navicular bone (Figs. 61 and 70), and is finally inserted on the base of the pedal bone (Fig. 68).

The parts at which the perforans tendon would be most likely to be sprained, are its attachment to the pedal bone, and the point where it passes over the sesamoid bones. On carefully examining the perforatus—the hindmost one of the two back tendons—we may conclude that it can rarely become injured from excessive tension; although it is specially liable to suffer from blows inflicted by the hind foot.

If we examine the movements of the horse in the gallop or canter, we shall note that after the leading fore has been brought down on the ground (Fig. 10), the fetlock descends (Fig. 11), by reason of the weight of the body being thrown on it, during which time most of the strain falls on the check ligament and suspensory ligament. When the fetlock has reached its utmost limit of descent, the fore-hand is raised by the straightening of the leading fore leg (Figs. 12 and 13), which is slightly aided in the canter by the straightening of the non-leading fore leg. It is evident that the straightening of the fetlock joint is accomplished by the muscles of the back tendons, which are consequently liable to sprain at that time, especially if the ground is so "holding" as to offer resistance to the withdrawal of the foot from the soil. The back tendons of the hind limbs are apt to get sprained when the horse is drawing heavy loads, because propulsion is obtained by straightening of the legs.

SPRAIN OF THE CHECK LIGAMENT.—This injury is common among cart-horses. It also occurs to saddle-horses, in which case it appears to be invariably the result of a sudden jerk, caused by the animal placing his foot on some inequality of the ground. I have known several instances of it happening to racehorses that were exercised on courses which were cut up by ruts of wheels, etc., crossing them. As I have already pointed out, the check ligament in connection with the portion of the perforans tendon beneath it, serves as an assistant brace to the suspensory ligament, which may become divided, and the fetlock pad may come to the ground, without the check ligament being injured at all. That this sprain must occur during extension (descent) of the fetlock, is evident; because the moment the foot is flexed, the check ligament is thrown into a state of rest. Again, it rarely happens during the gallop on level ground, at which pace there is extreme extension of the foot at each stride. Hence, it strikes me that the usual manner in which it gets sprained, is by a sudden jerk at a time when the upper portion of the perforans tendon is relaxed, so that the whole of the shock has to be borne by this ligament. In the case of a sound cart-horse walking at ease, or going down hill with a heavy load behind him, the heel first comes to the ground, then the toe; the heel is now raised, and finally the toe quits the ground. But when he is moving a weight which taxes his strength considerably—particularly when drawing it up hill—the toe first meets the ground (Fig. 14), at which moment the flexor muscles are contracted, their tendons are in a state of tension, and the check ligament is at rest. Then, as the weight is overcome at each step, the flexor muscles are suddenly relaxed, and the heel is brought down to the ground with a quick jerk, which is communicated to the

check ligament, at a time when it is unassisted, in bearing the strain, by the upper portion of the perforans tendon. The more the horse's strength is taxed, the higher will the heel be raised from the ground on the toe first touching it, and the greater the consequent jerk will the check ligament receive. The steeper the hill which the horse faces, the longer space will the heel fall through, before it reaches the ground, and, naturally, the greater

Fig. 10.

Fig. 11.

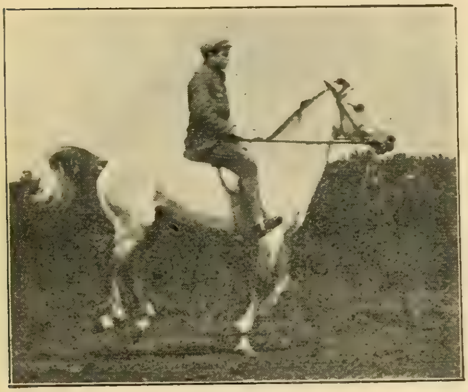


Fig. 12.

The Canter.

Fig. 13.

will be the strain on the check ligament. If we raise the heel by calkins, or by thick-heeled shoes, we shall thereby shorten the distance through which the heel falls, and shall, consequently diminish the liability to sprain. Practical experience teaches the advisability of doing this. It also proves that sprains of this ligament are more apt to occur going up hill, in draught, than on level ground; and that they hardly, if ever, happen going down hill, which is a mode of progression that throws particularly severe strain on the suspensory ligaments.

The foregoing remarks on the manner in which this ligament becomes sprained at a walk in heavy draught would, I submit, lead us to the conclusion that when this accident occurs at a fast pace, it must do so by reason of a jerk caused by the toe coming on the ground at a moment when the heel is unsupported; for instance, when the horse puts his toe on a stone or small mound of hardened earth.

Sprain of the check ligament constitutes what is commonly called sprain or clap of the back sinews.

SYMPTOMS OF SPRAIN OF THE CHECK LIGAMENT.—As sprain of this ligament usually occurs at its junction with the perforans tendon, there will be more or less swelling at the upper half of the leg between the knee and fetlock. Soon after the accident

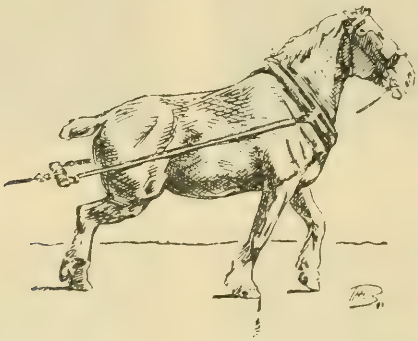


Fig. 14.—Heavy draught.

occurs, the ligament becomes hot, tender, and swollen, a condition which may be perceived by passing the fingers over the part that lies between the back tendons and the cannon bone, and extends from immediately below the knee to about one-third of the way down towards the fetlock. We may readily determine the seat of the injury, from observing that the back tendons and suspensory ligament are unaffected in the first instance. In a day or two the back tendons, viewing them sideways, assume a more or less "bowed" appearance, by reason of the exudation invading them. In mild cases of injury to this ligament, the symptoms are heat and fulness of the part just below the knee, with only a trifling degree of lameness. In severe cases, there is well-marked lameness; and the horse, when standing, rests his toe on the ground in order to throw the injured ligament into a state of rest.

After a bad sprain of the check ligament, we often find a permanent thickening, somewhat in the form of a knot, at the point

Fig. 15.—Sound leg.

Fig. 16.—Sprained check ligament.

Fig. 17.—Sound leg.

Fig. 18.—Sprained perforans tendon.

where the ligament joins the tendon, about three inches below the knee. The existence of such a thickening materially detracts from the value of the animal. At other times, there is a permanent fulness of the ligament just below the knee, and, generally more on the inner than on the outer side of the leg, without there being any appearance of a knot on the back tendons.

TREATMENT FOR SPRAIN OF THE CHECK LIGAMENT.—See page 44 *et seq.*

SPRAIN OF THE BACK TENDONS.—The perforans tendon is, as a rule, sprained at the point where it passes over the fetlock. If the injury be severe, the swelling will generally extend to the perforatus. There is usually a great deal of swelling above the fetlock joint, accompanied by heat, pain, and lameness. In the early stages, before much swelling takes place, the seat of the sprain may be detected by feeling the tendons with the fingers. Unless the sprain is extremely slight, the exudation and extravasated blood in the part will cause the tendons to assume, more or less, a bowed appearance (Figs. 16 and 18, which we may advantageously compare with Figs. 15 and 17). The "bow" caused by sprain of the check ligament is naturally somewhat higher up, than that induced by sprain of the perforans. In both cases, though present, it is often so little prominent as to escape notice except by a practised eye. "Sprain of the sheath of the back tendons" is a term sometimes applied to a slight sprain of the perforans, in which there may be no lameness, only a little thickening along the course of the tendons between knee and fetlock. I cannot help regarding the use of this expression as an ingenious effort to make light of a very grave accident; for I do not see how the sheath can be sprained, without the tendon having been seriously involved at the same time.

If we place our fingers on the back tendons of a sound leg, we shall find that, besides being hard and comparatively thin, they feel as if they were hollowed out on the inner side of the leg; but in a limb which has suffered from sprain of the back tendons, they feel round (like a rope) on the inside, as well as abnormally large and soft, and are frequently "bowed."

Professor Dick regarded rupture of some of the fibres of the perforans tendon, as a frequent cause of navicular disease. It is more probably a result than a cause of that complaint.

TREATMENT FOR SPRAIN OF THE BACK TENDONS.—See page 44 *et seq.*

Sprain of the Fetlock Joint.

When this joint is found after work to be swollen and hot, with or without lameness, it is often difficult to discover the cause of injury: whether sprain, concussion, or a blow. When concussion is alone to blame, the suspensory ligament and the back tendons will at first be in a normal condition, and the swelling, I am inclined to think, will be confined to the synovial bursa which lies between the suspensory ligament and the cannon bone, and which may be felt in the form of a puffy swelling on each side of the

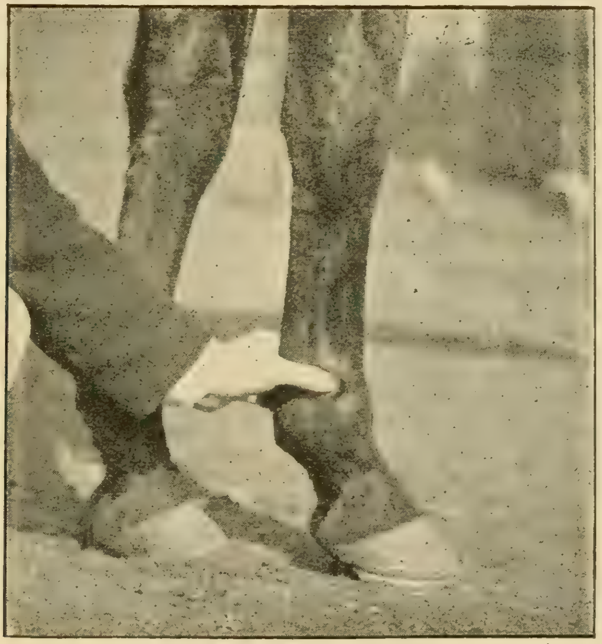


Fig. 19.—Site of windgall caused by sprain of fetlock.

fetlock by the forefinger and thumb when the hand is placed on the joint, as in Fig. 19. By alternating the pressure with finger and thumb, the fluid will be felt to pass through from one side to the other. In health, no distension of this bursa will be present. As an inflammatory swelling is liable to invade neighbouring parts, the difficulty of finding out the exact seat of the injury will be increased after a short time.

In the more serious case of sprain, the vacant space between the back tendons and suspensory ligament, just above the joint, may also become filled with synovial fluid; in other words, a windgall may be formed. I venture to think that the sprain in these cases is more often sprain of one or both of the lateral ligaments of the joint (the outer one more frequently than the inner one) than of

the suspensory ligament. It appears to be caused as a rule by a twist being given to the leg, usually when the horse is making a sharp turn at a fast pace. If we find that the bursa which is between the sesamoid bones and the perforans tendon is distended, so as to take the form of a hard swelling at the back of the fetlock, we may regard the case as very grave; for this symptom often denotes an injury which is but little amenable to treatment, and which is known as *sesamoiditis.* If pressure be put on one side of this swollen bursa, it will bulge out, as I have said, on the other side. Its hardness is due to the fact that the part admits of but little room for distension. Sesamoiditis appears to be caused by the tearing away of some of the fibres of the suspensory ligament from the sesamoid bones to which they were attached. It is a serious and intractable disease; for although the lameness may disappear with rest, it will certainly return if the animal be put to hard work.

"Knuckling over" is, as a rule, the result of sprain and severe work, and is due to relaxation of the lateral ligaments of the fetlock joint. In young horses it is sometimes caused by weakness.

TREATMENT FOR SPRAIN OF THE FETLOCK JOINT AND FOR SESAMOIDITIS.—See page 44 *et seq.*

Sprain of the Inferior Sesamoid Ligaments.

These ligaments, three in number, lie at the back of the pastern, and proceeding from the base of the sesamoid bones, connect them with the pastern bones. Their office is to aid in preventing over-extension of the fetlock joint, and to support the limb during muscular repose while the horse is standing, in conjunction with the perforans tendon and check ligament.

SYMPTOMS.—The part is hot, swollen, and tender; and the synovial sac which is at the back of the pastern, and immediately below the fetlock joint, is distended with fluid. The horse endeavours to relieve the injured structures by keeping the fetlock joint bent, and tries to avoid bringing the heel to the ground. There is great lameness.

Treatment of Sprains below Knee and Hock.

In treating these accidents, the inexperienced horse-owner need not concern himself much, if he be unable to determine the exact structure involved, so long as he can find out the seat of injury; for all these tendons and ligaments, when sprained, can be treated in the same way. Experience has taught me the advisability of rely-

ing in such cases, solely on uniformly distributed pressure, massage, and passive exercise. I apply the pressure in the following manner, for sprain of the back tendons, suspensory ligament, or check ligament, for instance. The modifications necessary for its application to the fetlock joint, hock, or pastern are self-evident.

Take two yards of cotton wadding (which can be obtained from any draper), and cut it down the centre, so as to have two pieces of wadding, each a couple of yards long and about 10 inches wide. In some shops, cotton wadding is sold in short pieces, instead of in

Fig. 20.—Cotton wadding placed loosely round a fore leg.

Fig. 21.—Cotton wadding applied tightly to a fore leg by means of bandages.

long rolls, which is the more convenient form for the present purpose. Wrap the leg round with the wadding, one piece over the other, in the way shown in Fig. 20, and apply, rather loosely, a calico bandage (which can be got ready-made from any chemist, or can be constructed out of a piece of unbleached calico) about 6 yards long and 3 inches wide, so as to keep the wadding in place; and put on tightly another and similar calico bandage, so as to afford firm and evenly distributed pressure on the leg, and secure it by tapes, sewing, or by a safety-pin. The wadding and bandages will then give the appearance shown in Fig. 21. With the amount of wadding I have recommended to be used, there is practically no

danger of putting on the second bandage too tightly. I find that it is easier to distribute the pressure evenly with two bandages, than with one. If we cannot get cotton wadding, we may substitute $\frac{1}{2}$ lb. of ordinary cotton wool (the medicated kind will not do as well, because it has lost a great portion of its elasticity) and arrange it round the leg; or we may use some other similar material, such as sponge, wool, or moss. I have sometimes found when using cotton wool for the object in question, that its presence next the skin gives rise to irritation, which untoward result I have been able to obviate by, in the first instance, wrapping the leg loosely round with a piece of soft cotton cloth, or by putting on an ordinary flannel bandage, and the cotton wool over it. I have in no case known irritation of the leg to be caused by the cotton wadding bandage put on as I have described. No matter how bad the sprain over which it has been placed, I have invariably found that its application was followed by marked relief in the symptoms, provided, of course, that it was employed during the early stages of the injury; that is to say, before the exudation had become solidified and more or less organised. We should remember that its use is to remove fluid, the presence of which is liable to seriously impair the soundness of the part. The bandage may be taken off after twenty-four hours, although it is generally better to let it remain on for double that time in the first instance. After the bandage has been removed, the foot should be lifted off the ground, held up and the part carefully hand-rubbed (p. 666); the leg bent and extended a few times; and a fresh bandage of the same kind put on; care being taken that none of the material used has become caked. The bandage may now be removed morning and evening, and the part hand-rubbed and passively worked by taking up the leg and bending the joints without demanding any muscular effort from the horse.

In case of descent of the fetlock, support can be given to that joint by filling up the hollow at the back of the pastern by tightly packed cotton wool, or other suitable material, over which a firm bandage should be placed. A tennis ball might be utilised for giving the required support. For the purpose in question, the special shoe shown in Fig. 22 can be used with advantage. When placed on the foot, the fetlock rests on the cross bar, which should be covered with soft material.

In bandaging for sprains, on or above the knee and below the elbow, we should first of all put a cotton wadding bandage, which need not be tightly applied, on the leg up to the knee, so as to prevent the bandage which we intend to place on the injured part, from slipping down.

I am indebted to Dr. Henderson, of Shanghai, for suggesting to me the use, in horse practice, of this form of bandage, which I

described for the treatment of sprain in "Hayes' Sporting News" of 20th of October, 1888 (Calcutta). Since that time, I have used it with such marked success, that I now trust solely to it and massage (p. 664) in the treatment of those sprains to which I can apply it. I am glad to say that many other persons to whom I have taught this method, have obtained equally good results. I have certainly found it to be the most useful improvement ever introduced

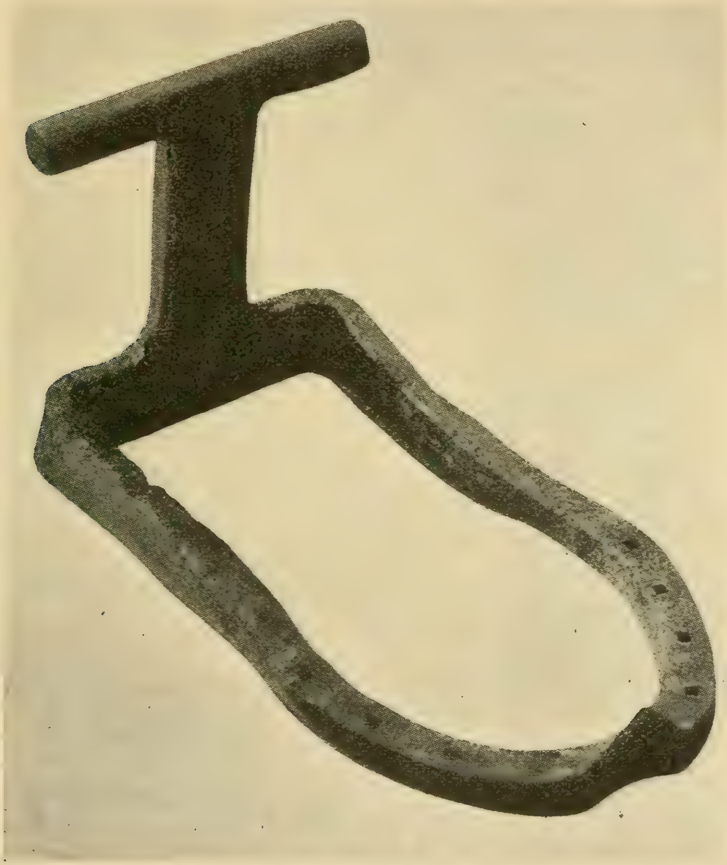


Fig. 22.—Shoe with cross-bar for giving support to fetlock.

into veterinary surgery. Although I have laid stress on the fact that the early stage of sprain is the time when special benefit can be obtained from well-adjusted pressure, I would wish to point out that it is also efficacious for the removal of exudation and synovial enlargements which often accompany old sprains of tendon and ligament. The benefit of pressure in the case of recent sprain, is, I may again point out, to cause the removal of the fluid which produces the swelling, and to place the injured fibres in the best possible position to become repaired.

Besides its efficiency, treatment of sprains by bandaging, so as to obtain evenly distributed pressure, has the great advantage of being inexpensive, easy of application, and requiring but very little subsequent attention.

For directions as to physic, feeding, shoes, bedding, etc., see page 26 *et seq.*

As soon as heat and soreness have left the part, we may gradually commence exercising the horse very gently.

If a fortnight, or so, of treatment by cotton bandaging and hand-rubbing does not produce the desired effect, or if it entails too much trouble to carry it out, we may apply a *charge*, which is an adhesive plaster that may be arranged as follows:—Take 4 ounces, each, of Burgundy pitch and bees'-wax; melt them together; and stir in 2 oz. of mercurial ointment. Apply the mixture, taking care that it is not so hot as to hurt the skin, to the leg by means of a stiff painter's brush, so that a thick coating shall cover the back tendons, and fill up the depressions on each side. Place, from time to time, cotton wadding, cotton wool or tow on both sides of the leg, and then cover it with the mixture, until the part presents a round appearance. Over the whole, roll tightly a cotton bandage (about 18 ft. long and 3 in. wide), between the folds of which the mixture is to be freely plastered, so as to obtain uniform and firm pressure. The bandage may be finally secured by sewing. According as it works loose, it should be unrolled, and tightened up afresh, from time to time. It should not be kept on longer than a month, lest it make the skin sore.

A charge acts by pressure.

We should give a long and complete rest from work which throws undue strain on the part; taking care, however, when the structures have, to all appearance, recovered their normal strength, to gradually increase the work, within thoroughly safe limits, until the animal attains his ordinary standard of labour. After a severe sprain of structures below the knee or hock, I do not think that a hunter or race horse should be put into strong galloping work sooner than three months subsequent to the accident. The time need not be so long with trotters; for, at their pace, when one foot comes on the ground, it is always supported by its diagonal fellow; that is, the near fore, by the off hind; and *vice versâ*. It is, here, evident that the trot should be largely used in bringing gallopers which have sprained their fore legs, into full work; that is, in preparing them to stand the strain of a sharp gallop.

We should avoid giving work which is both fast and long to race horses that have suffered from any of the injuries in question. If it has to be fast, it should be short; if long, it ought to be slow. Half-a-mile or three furlong gallops, repeated a couple of times, with

half-an-hour's rest between, and not oftener than three times a week, will generally be as much as a race horse, rendered infirm by a sprain, can safely stand. If he shows signs of heat or tenderness after a "spin," it should not be repeated till these symptoms have disappeared. The ground on which such "screws" ought to be worked, should be soft, springy, free from inequalities, and up a gentle incline. Hard, "holding," or slippery ground is particularly unsuitable. If the horse is used for heavy draught, he ought to be shod with calkins; if for light harness or saddle-work, his toes should be kept low and his heels allowed to grow down a little, or he may be shod with thick-heeled shoes, if his heels are naturally weak, so that, in any case, the slope of his fore feet, to the front, may not be less than 50°; and that of the hind not less than 55°.

If the leg "fills" after work, the best means to keep it fine is to hand-rub (p. 666) it well when the horse returns to its stable, and to apply a cotton wadding bandage (p. 45), which should be removed, and the leg again hand-rubbed before the animal is taken out. For further remarks on this subject, see pages 51 and 52.

FLANNEL BANDAGES.—Flannel bandages are useful for giving pressure, affording support, and keeping up the temperature of the part in cases of the sprains which we are considering. For stable use, a bandage should be about 8 ft. long and 4½ in. wide. It should be of thick, close material, similar to that used for cricketing trousers. Serge should not be employed, as its texture is too harsh. Bandages, specially made, with a selvage on each side, can be obtained from any saddler. They are, however, often too short, too thin, and too wide. A bandage to be ready for immediate use should be wound up with the tapes inside. When about to put it on, we should unroll 6 or 8 inches of it, and lay this loose portion obliquely across the outside of the leg, close to the knee, with the end reaching to about the centre of that joint, and the rolled-up part turned to the outside, and directed downwards and forwards. The bandaging should be continued down to, and around the fetlock and upper part of the pastern, and brought close up below the knee. The loose end is then turned down, and the folds of the bandage carried over it. The tapes are tied a little above the centre of the cannon bone. By this method, no twists need be taken in the bandage, which will lie close.

If a bandage is used at fast work, as in the case of a hunter or race horse, some nicety of arrangement is requisite in order to prevent the inner end of the bandage working free. This accident is apt to occur, especially with an elastic bandage, when the animal is galloping, if it is put on in the ordinary manner. When the bandage thus becomes unrolled, and remains attached to the leg

only by the tape, it is liable to trip the horse, by the animal putting a hind foot on it, and thus preventing the leg to which the bandage is attached from being advanced. To lessen the chance of this occurring, we should put on the bandage in the manner described in the preceding paragraph, except that the end of the bandage, in the first instance, should be brought two or three inches above the knee (Fig. 23), so as to allow a comparatively long free

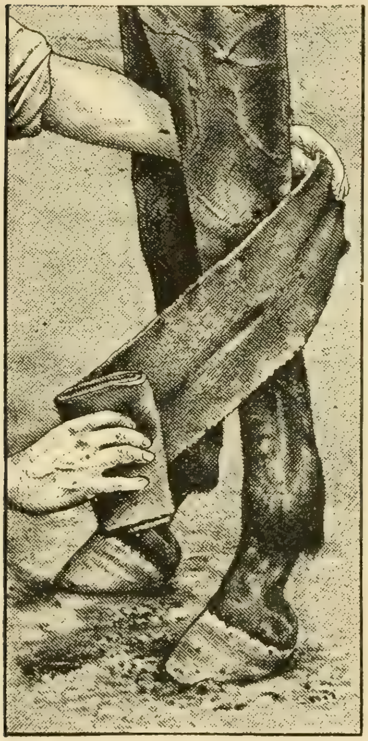


Fig. 23.—Commencing to apply bandage to leg.

Fig. 24—Securing loose end of bandage.

end to be turned down (Fig. 24), and to be firmly secured by the bandage being rolled over it; and that no turns should be taken round the pastern with the bandage, the lower part of which should be just clear of the fetlock joint (Fig. 25). The inner end will now be firmly secured between the cloth on both sides in the manner just described.

I have found that the liability of a bandage to become undone while a horse is in movement, is directly proportionate, other things being equal, to the difference in width of the leg at the fetlock and the width just below the knee. When this is small, as is usually

the case with well-bred animals, the back tendons run nearly parallel to the cannon bone; and consequently the turns of the bandage can be put on evenly. When, on the contrary, the width of the fetlock is large, and the horse is somewhat tied-in below the knee,

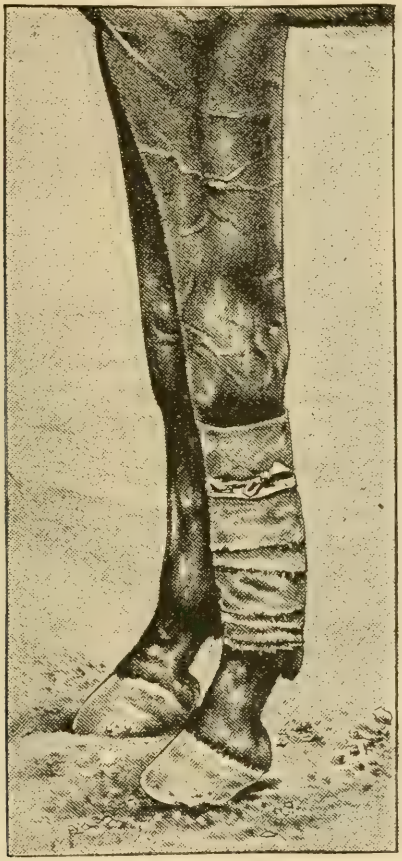


Fig. 25.—Bandage completed, and with end secured.

each turn of the bandage will necessarily be looser at its upper edge than at its lower one, which fact will naturally tend to make the bandage work loose, especially during a long day, as out hunting.

Filled Legs.

Though this term is not scientific, it is well understood by horsemen to mean a condition of the legs in which there is more or less swelling (p. 15), due, generally, to passive congestion (p. 14), and "work." As sprains are a fertile cause of "filled legs," I have placed this paragraph in the present chapter. The form of filled or swollen legs to which I wish to direct the attention of my readers,

is that in which the legs more or less "fine down" by exercise, and "fill" again after the animal has been in his stable for some time. The best treatment is the application of cotton wadding bandages (p. 45), immediately after the horse returns from work, and hand-rubbing. It is evident that our object should be to prevent the occurrence, and to lessen the amount, of the swelling which interferes with the blood-supply of the part. Before the horse is taken out again, the cotton wadding bandages should be removed, and the legs well hand-rubbed (p. 666). Although purgatives and diuretics may relieve the swelling for the time being, they in no way remove its cause. Besides, their frequent use would injure the animal's health.

Curb

is a swelling which appears at the back of the hock, about six inches below its point, in a full-sized horse. It is caused by an enlargement that displaces the back tendons, at the affected spot, out of the straight line they normally preserve from point of hock to fetlock (Figs. 26 and 27).

NATURE OF THE DISEASE.—The bones at the back of the hock are strongly bound together by a mass of ligamentous fibres (Fig. 28) which are attached to the os calcis, to the large and small cuneiform bones, to the cuboid bone, and to the heads of the splint bones and of the cannon bone (Fig. 29). The rigid bar (or united column of bones) thus formed from point of hock to fetlock, acts, in conjunction with the bones below the fetlock and with the hoof, as a lever for straightening out the hock when the foot is on the ground; for instance, during propulsion in the various paces, in leaping, and in supporting the body when the horse rears. Here we have a lever of the second order, in which the fulcrum is the ground; the weight, the resistance offered by the head of the tibia, through which bone the propulsive or weight-bearing effort is transmitted; and the power, the muscles (those of the gaskin) which are attached to the point of the hock. It is evident that in the working of this lever, strain will be thrown on the ligaments which preserve its rigidity. Hence, during violent efforts to straighten the hock, or to prevent it from becoming bent, while the foot is on the ground, some of the binding ligamentous fibres are liable to give way, naturally at their weakest point, which will be one or other of their points of attachment on small surfaces of bone; that of the cuboid bone or head of the outer splint bone, for example. As their attachment to the back of the os calcis is of large extent, their connection with it is not likely to be severed. A serious giving way of the ligaments will be followed by displacement of the bones of the hock, in which case the point of the hock (upper end of the os calcis) will be drawn forward, similarly to what happens in "flat foot" of man, of which Fig. 30 shows an aggravated instance. We should here bear in mind that the heel of man corresponds to the point of the hock of the horse. In ordinary cases of curb, the injury seems to consist of the tearing away, to a greater or less extent, of ligamentous fibres from their bony attachments, with little or no displacement of the column of bones; the result being—agreeably to the remarks made by Goubaux and Barrier on bone tumours, see page 230—that a bony enlargement forms at the back of the hock as a consequence of strain which has too severely taxed the strength of the ligamentous brace in question. When the enlargement is on or near the cuboid bone, the back tendons will be more or

less pushed out of the straight line which they usually form down the back of the hock, and a curb (Fig. 27) will be the result. If the head of the outer splint bone be the seat of injury, a *jarde* (Figs. 84 and 85) will be the consequence. With respect to enlargement, from similar causes, of the head of the cannon bone in producing curb, see page 246. The tendency to curb will manifestly be increased (1) by the work being of a nature to severely

Fig. 26.—Sound hock.

[Fig. 27.—Hock with curb.

test the strength of the said lever; (2) by the parts being unfitted, by disuse or immaturity, to successfully resist violent strain; (3) by the surfaces of ligamentous attachment being comparatively small, as when the animal is "tied-in below the hock;" (4) by the muscles of the gaskin being particularly strong, so that the power in increased; and (5) by the direction of the weight forming a comparatively large angle with the lever, as would be the case in a horse which has "sickle hocks." I refrain from citing comparative length of os calcis as a predisposing cause of curb; for as far as I can see, its length as a rule is proportionate to that of the bones below the hock. The gaskin is the part of the leg between the hock and stifle.

The calcaneo-cuboid ligament is the term usually applied by English veterinary surgeons, to the ligamentous mass, a portion of which gets sprained in a case of curb. A more correct title would be "the calcaneo-metatarsal ligament;" for that would express its extreme points of attachment. It is more convenient to regard this bundle of fibres as one large ligament with a single attachment on the os calcis at its upper end, and several (corresponding to the cuboid, cannon, splint bones, etc.) at its lower end, than to split it up, more or less artificially, into a number of respective ligaments.

The local character of the swelling of curb is a strong proof that the

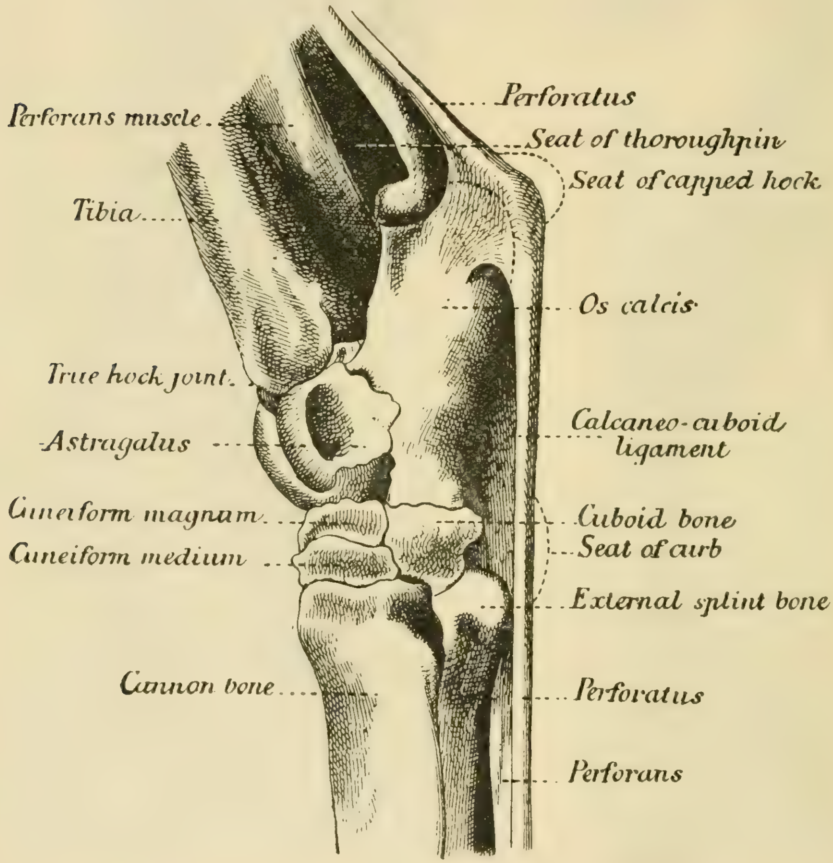


Fig. 28.—Outside view of near hock, with some of the structures removed.

prominent condition of the enlargement is due to a bony tumour, or to displacement of bones rather than to inflammation of ligament, the swelling of which is always more or less diffuse. Besides, the good effect of severe blistering, and especially of firing, for removing lameness in recent cases of curb, clearly shows that the pain which causes the lameness is not as a rule that of sprain to ligament or tendon. The preceding remarks on the nature of curb most strongly suggest to me the conclusion that the accompanying pain in recent cases is generally the result of an inflamed condition of bone, aggravated more or less by the pressure of the back tendons on the part. In arriving at this opinion, I in no way desire to ignore the fact that the injury which gives rise to the offending bony tumour is a sprain of

ligament that requires rest for its repair after the lameness has disappeared. I have sometimes found that the incapacity to stand strong work which some old cases of curb-affected hocks exhibit, is due to the fact of the ligamentous structure at the back of the hock being more or less weakened by previous sprain. Here we may usually conclude that an inflammatory condition of bone had ceased to exist; although it is quite possible that in some exceptional cases, rheumatoid arthritis (page 269) might be present.

Fig. 29.—Outside view of bones of near hind leg. (*After Chauveau.*)

DETECTION AND SYMPTOMS OF CURB.—To detect a curb properly, the observer should view the leg in profile, and should let his eye run from the point of the hock down the back of the joint, and along the course of the back tendons. If he finds that this line is straight, as in Fig. 26, and, consequently, without a bulge at any part, and that the horse is not lame, he may conclude that the animal is free from curb. A view from both sides should be taken. As I have already said, the prominence of curb appears in a full-

sized horse, at about six inches below the point of the hock. In quite recent cases, it usually takes the form of a rounded knob. In time, this swelling becomes more diffuse by spreading upwards and downwards.

When the head of the external splint bone is unusually large, a prominence, somewhat resembling that of curb, may be observed, if an outside view of the hock be taken, though it will not be apparent when the joint is regarded from the other side. The observer may satisfy himself on this point by feeling with the tips of his fingers to ascertain if the course of the back tendons is straight. If the case be difficult to decide, the animal's age, style of going, and the form of the other hock, should be carefully considered. As a rule, a horse should not be passed sound, if any abnormal conformation is confined to one hock; although, had both been symmetrical, yet slightly differing from the usual shape, little, if any, exception might be taken.

The term "curby hocks" is an ill-defined expression, which is sometimes used as synonymous with "sickle hocks," and which then means that the hocks are bent, *i.e.*, that they cannot be straightened out as fully as can usually be done.

Men wishing to sell a horse which has a curb, sometimes try to make out that the swelling is simply the result of a blow, the truth of which assertion may be readily tested by noticing if the swelling is superficial or deep-seated. If it be of the latter nature, we may conclude that it is due to the presence of curb. Horses sometimes knock their hocks near the seat of this injury when jumping stone walls, or from kicking in harness.

In severe curb lameness, the animal, to avoid throwing pressure on the inflamed part, may keep the limb raised.

HEREDITY.—Animals which have suffered from curb, ought not, as a rule, to be used for stud purposes; for the conformation that renders a hock liable to this injury, is often transmitted to the offspring.

TREATMENT.—A high-heeled shoe (Fig. 4, p. 27) should be put on, in order to place the part in a state of rest. The rough-and-ready method of applying, in the first instance, biniodide of mercury ointment, at a strength of 1 to 4, and well rubbed in, is probably the best; for by adopting it, the horse will generally be fit for work as soon as the effect of the blister has subsided. A solution of 30 grains of corrosive sublimate to 1 oz. of spirits of wine is preferred by some to the biniodide of mercury application; but it has the disadvantage of being more liable to blemish than the other. In chronic cases, there is nothing so effective as firing,

which may be done in horizontal lines, or by puncture. The plan of fomenting the part, giving a dose of physic, which would be advisable in most cases, and applying a blister when the local heat has disappeared, entails far greater loss of time than the other, and as a rule is not so effective.

LEGAL ASPECT OF CURB.—Legally, a curb is an unsoundness whether or not it causes lameness. A horse with a curb may be passed as practically sound, if the presence of the curb does not affect his action. As great strain is put on the hocks when jumping,

Fig. 30.—Flat foot (curb) of man. (From an article on "The Surgery of Deformities," by H. H. Clutton, M.B., F.R.C.S., in Treves' "A System of Surgery." Cassell & Co., Limited.)

I have a strong prejudice against curbs in hunters. At the same time, the fact remains that many good hunters and steeplechase horses have curbs which do not impair their jumping or galloping powers in the slightest degree.

Sprung Hock

is a condition in which there is a severe sprain of this joint, accompanied by extreme lameness, and great swelling both above and below the inner and back aspect of the hock. The back tendon (the perforans) which passes over the os calcis (Fig. 98, p. 257) may also be sprained in this injury.

I have seen a few cases of slight sprain of the ligaments of the hock which were characterised by heat at the front part of the joint,

with lameness, and which were caused by the horse's foot getting caught in a fence when jumping.

In sprung hock, there is high fever and great pain.

TREATMENT.—Put the animal into slings; for he will not lie down to rest, because the injury is in a hind leg; and treat as described on pages 26 to 28, and 44 to 49.

After this accident, the animal should have about eight or nine months' rest, which will probably render him capable of doing useful work.

Sprain of the Shoulder.

ANATOMY.—The shoulder joint (Fig. 31) is formed by the shoulder-blade (Fig. 115) and humerus. This ball-and-socket joint being required to possess great power of extension and flexion, as well as some side play, is bound down by only one ligament (the capsular); the office of other ligaments being taken by the tendons of certain muscles which pass over it, and thus help to keep it in place. A large muscle (the *flexor brachii*) takes its origin at the head of the shoulder-blade, passes over the shoulder joint, and is attached to the head of the radius. Its action is to straighten the shoulder joint and raise the knee. The shoulder joint is kept close to the side by the pectoral muscles, which connect it, above and below, to the body, and thus prevent it from bulging outwards. Two of these muscles (the deep pectorals) act in drawing the point of the shoulder backwards and downwards.

NATURE.—The shoulder is so large, and its component parts so concealed from sight and touch, that, in the case of shoulder lameness, it is often very difficult to locate the seat of injury. Formerly, sprain of the pectoral muscles was regarded as the most frequent cause of this lameness, on account of these muscles generally being, in such cases, unable to perform their usual function of keeping the shoulder joint close to the body. This muscular inability is also seen in fracture of the first rib (p. 310), which is a frequent cause of shoulder lameness. We may also have sprain of the flexor brachii, sprain of the capsular ligament, and injury to the nerves of the part, or to the joint itself.

CAUSES.—The usual causes are: (1) over-exertion of the pectoral muscles, which is specially liable to occur with young horses when ploughing, to which they are put, as a rule, at an earlier age than to any other kind of labour; (2) wrenches when turning, and slips, by which the shoulder is pulled forcibly outwards and sometimes forwards, in direct antagonism to the action of the pectoral muscles; and (3) falls or blows, by which the joint and its neighbouring parts may be injured.

SYMPTOMS.—When the pectoral muscles are affected, the point of the shoulder is seen to bulge out at each step, and the foot is swung outwards as it is brought to the front, as in fracture of the

first rib (p. 310). When the flexor brachii is hurt, the animal will naturally "drag" the leg from inability to raise it. As the flexor brachii extends the shoulder joint, when raising the leg; unwillingness to lift the leg up will also be shown, when movement of the shoulder joint is accompanied with pain, as in injury to the capsular ligament, or to the joint. In neither sprain of the pectoral muscles, nor of the flexor brachii, will the act of placing the foot on the ground cause any special pain. Wherever the lameness may

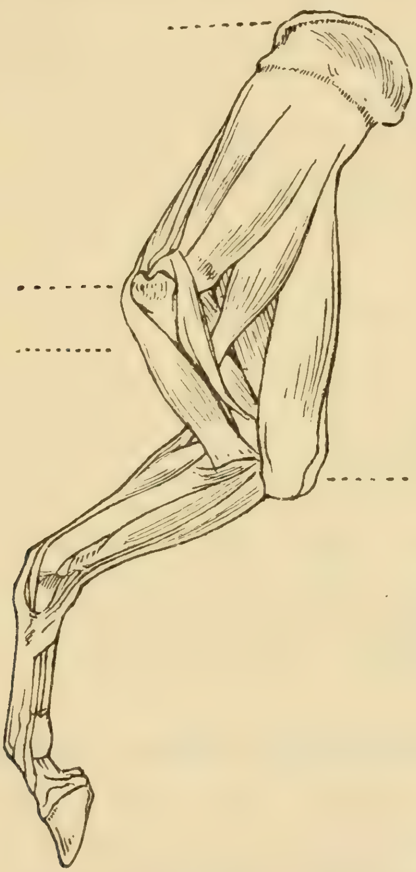


Fig. 31.—Muscles of the fore leg. (*After Chauveau.*)

be, the horse will take a very short step to the front, and, on being reined back, will be inclined to drag the foot along the ground from more or less inability to raise it. In all cases, lifting up the leg and drawing the limb forward with the hand will hurt the horse; for it will render tense the pectoral muscles and the flexor brachii, and will extend the shoulder joint. In thus manipulating the limb, we should avoid mistaking restlessness for soreness. We should, of course, compare both shoulders, and should note if there be any local heat, swelling, or tenderness. Unrelieved sprain of

the shoulder will soon be followed by wasting of the muscles of the shoulder, but not of the muscles of the fore-arm. In chronic lameness of the foot, all the muscles of the limb will tend to equally waste away. The wasting of the shoulder muscles will be made manifest by the increased prominence that will be given to the spine of the shoulder-blade, which is the bony ridge that stands out at right angles to the outward surface of that bone, and divides it into two parts.

The flexor brachii, being a hard tendinous muscle, is apt, after having been sprained, to become turned, more or less, into bone, and consequently to lose its power of contraction; hence the gravity of a sprain of this muscle.

Sprain of the capsular ligament is a most serious accident; as it may lead to stiffening of the shoulder joint.

As a rule, sprain of the shoulder when taken in time and properly treated, is an injury which does not materially impair the value of the animal.

The shoulder, though often accused of being so, is rarely the seat of lameness.

TREATMENT.—The cure of these affections depends entirely upon its being attempted early, that is, before organic change has taken place; the best treatment being rest with a high-heeled shoe (Fig. 4, p. 27) on the foot of the affected limb, massage (p. 664) and passive exercise. Many authorities recommend fomentations followed by repeated blisters, in order to determine an increased and continued supply of blood to the part for the repair of the injury. After recovery, the particular kind of work which induced the disease, should be discontinued if possible.

Sprains of the Elbow and Hip.

These are rare accidents, which may be distinguished by the presence of lameness, with local heat, pain, and swelling; and by the absence of symptoms of disease in other parts. In elbow lameness, the horse shows great unwillingness to put weight on the limb; for the action of the muscles which are attached to the elbow, is to straighten the elbow joint and thus to maintain the stability of the leg on the ground.

The "round bone"—the hip joint—is a favourite spot to which grooms ascribe disease when the horse goes lame behind; although it is very seldom affected. The hock is the usual seat of lameness in the hind limb.

TREATMENT.—The treatment is similar to that recommended for shoulder sprain.

Sprained Back.

The chief varieties of this accident are: (1) Sprain of the ligaments which connect the vertebræ of the loins and back together; (2) sprain of the "under-cut muscles" (similar to those of a sirloin of beef, or saddle of mutton); and (3) sprain of the large muscle (ilio-spinalis) which runs, on each side of the back-bone, along the loins and back. The action of the "under-cut" muscles is (when the hind legs are fixed) to bend the loins; that of the ilio-spinalis, to straighten them. The principal causes are: (1) Violent efforts to extend (straighten) the back, as when struggling on the ground with the hind feet secured and brought forward for an operation, jumping, or drawing a heavy load; (2) violent efforts to flex (bend) the back, as when a horse "slips-up" with his hind legs behind him, or when his hind legs get caught in a fence when jumping; and (3) falls.

The usual symptoms are those of more or less paralysis of the hind legs. If the horse is quite unable to support himself behind, even when lifted up on his feet, we may conclude that he has broken his back, an accident which is not incompatible with his possessing some sensibility in his hind quarters, and with the power of moving his tail; always supposing that there has not been displacement of the fractured ends of the broken vertebra.

TREATMENT.—If the patient can stand moderately well, put him in slings (p. 680); but if not, then let him lie down and keep an attendant to prevent him from attempting to rise. Give three or four enemas (p. 632), with intervals of a couple of hours between each, to clear out the intestinal canal, and, it may be, to soothe the inflamed parts. Give a pint of linseed oil as a drench, and proceed as directed under "General Treatment of Sprains" (p. 26 *et seq.*).

Legal Aspect of Sprain.

Any alteration of structure, caused by sprain, in a part which is concerned in the locomotion of a horse, is undoubtedly an unsoundness.

CHAPTER V.

Theory of Wounds and Bruises.

CHANGES LIABLE TO TAKE PLACE IN A WOUNDED OR BRUISED PART—VARIETIES OF WOUNDS—METHODS OF REPAIR—BACTERIA AND DISEASE GERMS—ANTISEPTIC TREATMENT OF WOUNDS—ARREST OF BLEEDING.

CHANGES LIABLE TO TAKE PLACE IN A WOUNDED OR BRUISED PART.—By the wounding or bruising of a part, the tenseness of the tissues, which opposed the pressure of the blood (p. 14), becomes diminished, and the parts become more or less swollen from increased transudation of plasma. Hamilton ("Text-book of Pathology") tells us that the union of the divided surfaces of wounds is effected always in the same manner, namely, by the growing together of the reparative material produced by each of the two surfaces. As these two layers of connecting material cannot unite as long as they are kept apart by discharge, blood-clots, or granulations; our first efforts should be directed in checking the bleeding and exudation, to do which we shall be greatly aided by pressure. "It is a fact familiar to every one that a clean-cut wound made into a part such as the finger, if kept free from organismal contamination, and if pressure be immediately applied to its edge, will be found adherent in twenty-four hours, and within a day or two, organic union is apparently completed" (*Hamilton*). If, however, the exposed tissues become contaminated by putrefactive germs (page 63) a corrosive discharge (pus, see page 15) will be established, and granulations (p. 15), from absence of pressure on the walls of the capillaries, will in all probability cover the divided surfaces. Our principles of treatment should therefore be: (1) to check the discharge; (2) to prevent the divided surfaces from becoming contaminated; (3) to bring them together; and (4) to apply pressure.

Union being impossible as long as granulations (proud flesh) exist; the reparative material which lies under them, has the power of destroying them by the pressure it sets up on the capillaries by spontaneous contraction (Hamilton). Hence we find that granulating surfaces will not unite, until the granulations disappear. Hamilton regards the beneficial action of caustics and stimulating lotions on granulating wounds, to be due to their hastening the growth of the reparative material.

The course of inflammation in bruises closely resembles that of sprains, except that the former, on account of injury to the skin, are more liable to become complicated by the formation of pus, than the latter.

VARIETIES OF WOUNDS.—The respective characters of wounds and bruises are so generally combined in injuries from external violence, that I have thought it best to discuss them under the same heading. We may therefore divide them into: (1) clean cuts; (2) punctures; (3) lacerated wounds, *e.g.*, "broken knees"; and (4) bruises.

METHODS OF REPAIR.—For practical purposes, we may adopt Paget's classification, which is as follows: (1.) Immediate union. Here, the parts being brought into exact contact, unite in a few hours, without any perceptible material being deposited between them; hence there is no visible scar. To obtain this result, which would be rarely possible in horses, the inflammation must have been very slight. (2.) Union by primary adhesion. In this, the divided surfaces are glazed over by a fluid which is exuded from them, or by the coagulation of a thin film of blood, either one, or both, of which substances may form in two or three days a temporary means of union, which material, as explained by Hamilton, will have to be absorbed before permanent union, which will leave a scar, can take place. In fact, the greater the quantity of this temporary adhesive material, the longer will the wound take to heal. (3.) Granulation. This is a tedious process which is invariably accompanied by the formation of pus, and is the one by which, as a rule, all wounds, except clean-cut ones, heal. (4.) Union of granulating surfaces. (5.) Healing under a scab. "All wounds heal in essentially the same manner, namely, by the growth and organisation of new tissue from corresponding old tissues already present in the part. The whole process is, strictly speaking, one of growth followed by organisation, and any differences which wounds present in bringing this to a successful issue are merely superficial" (*Hamilton*).

BACTERIA AND DISEASE GERMS.—Soil, water, and to a less extent air are filled with microscopic germs (bacteria) whose function is to set up decomposition in animal and vegetable matter that is in a fit condition for this change. Some of these germs (those of pus) cause putrefaction; and others, respectively, give rise to special diseases, such as tetanus, and various kinds of fever. Putrefactive germs are always present. The microbes of special diseases are only occasional visitors, or their numbers are usually too few to injuriously affect the system. In health, the skin and mucous membrane protect the body more or less efficiently from the action of bacteria. When either of these coverings become injured, as in the case of a wound or bruise, the underlying tissues are rendered specially liable to an attack of these germs, which fact is shown by the tendency that the seat of hurt has, in these cases, to form "matter" (pus); in other words, to suppurate. I have already explained that ordinary pus, like gastric juice, has the power of dissolving the tissues. Hence its unchecked presence in a part is characterised by the formation of matter resulting from tissue destruction. This diseased product (pus) may appear as a discharge from a wound, or as a collection of fluid in an abscess. The skin which covers an abscess becomes thin and weak, owing to the corroding action of the contained pus (p. 15); the usual result being that the abscess, if circumscribed in a sac, will in time tend to "point."

Contrary to what we might suppose, living tissues and blood do not form a particularly suitable place of residence for putrefactive and disease germs, especially if these microbes, as in ordinary air, are comparatively few in number. Also, the tissues have the power of resisting, to a certain extent, their inroad, and even of destroying them. Thus, the liability of a wound to infection, is influenced by the number of the germs, and by the resistance (or health) of the part. From these considerations and from experience we see that clean cut wounds which are exposed only to ordinary fresh air, will continue healthy for a far longer time than those which have become tainted with dirt and especially with decomposing matter, in which bacteria teem. Impure air, particularly, when loaded with dust, has highly infective properties; and water which is fit for drinking has only feebly infective power. A most important point to remember is, that moisture favours the development and multiplication of bacteria; hence the drier a wound is kept, the better will it resist their attack. I may add as an illustration bearing on this subject, that the more concentrated meat soup is, the longer will it keep fresh. The presence of bacteria in a wound is objectionable; because, as I

have already indicated, they not only injuriously affect the wound; but may also cause serious if not fatal damage to the animal's general health.

ANTISEPTIC TREATMENT OF WOUNDS.—In order to check the injurious action of bacteria, we apply to wounds certain agents called *antiseptics,* some of which, like iodoform, nullify the action of bacteria; and others, like carbolic acid, destroy them. In a surgical operation which necessitates the use of the knife, we employ an antiseptic to disinfect the parts about the wound, as well as the wound itself, unless we are certain that the wound is absolutely free from putrefactive germs, which are readily carried to it by the knife, ordinary water, our hands, etc. In applying an antiseptic, we must be careful that it is not so strong as to injure the divided tissues.

"*Asepsis* is the employment of means and substances absolutely free from infective agents. For example, water which has been boiled and which has thus become aseptic, can be used for washing wounds.

"All antiseptics have, more or less, an injurious action on the tissues, as well as on microbes, and therefore they diminish the power of resistance possessed by the part. *Aseptic surgery,* which is based on the employment of aseptic agents that have no injurious action on the tissues, has been invented, in order to avoid this drawback. Theoretically it is perfect; but in practice, the only true way to obtain asepsis, is to use antiseptics" (*Cagny* and *Gobert*).

From the foregoing considerations we may draw the following conclusions:—

1. That the fact of a wound of moderate size and untainted with dirt, remaining exposed to the atmosphere for even an hour or so, need not preclude the hope of getting it to heal without pus being formed.

2. That even if we cannot exclude bacteria from a wound, the more we hold them in check (by the observance of cleanliness and by the use of suitable antiseptics), the quicker will the wound heal, and the less risk will the animal run, of becoming inoculated by disease germs.

3. In the treatment of a wound which is free from bacteria (like those inflicted during an operation that has been carried out under strict conditions of cleanliness), we should, if possible, apply a dry dressing in preference to a wet one, for water favours suppuration (the formation of pus), which is the great hindrance to repair in a wound. If, however, bacteria have gained an entrance into a wound (as would be the case in broken knees and ordinary cuts, especially if they have become contaminated by dirt, we should freely wash the parts with some antiseptic solution (such as one of carbolic acid or creolin, page 67), so as to check the action of any bacteria that may be present.

ARREST OF BLEEDING.—Arteries are tubes which consist of three (internal, middle and external) coats or tunics. The internal coat closely resembles a serous membrane (the smooth membrane which covers the lungs or liver, for instance). The middle coat is formed of yellow elastic fibres, and of muscular fibres; the former predominating in the large arteries; the latter in the small ones. Hence, the larger the artery, the greater tendency it has to remain open when cut across. In the dead subject, we may recognise the presence of large arteries by the fact that their divided ends gape, and that they are empty. The external coat is composed principally of connective tissue, and is, consequently, much the strongest of the three. Veins are of similar structure to arteries, except that their tunics are much thinner and weaker.

If an artery is cut in two, the consequent irritation causes the muscular fibres of the middle coat to contract and thus to draw the ends of the artery into its sheath, and also to diminish the calibre of the tube, especially at its divided extremities. Owing to the fact that the passage of blood over rough surfaces increases its coagulability (p. 12), a coagulum is formed within the

sheath and in front of the cut end by the blood when flowing over the divided surfaces. The comparatively small amount of bleeding which takes place from arteries that are severed by scraping with a jagged knife, is chiefly due to the increased roughness of the divided parts over which the escaping blood passes. When the bleeding has been stopped by this external coagulum, "an internal coagulum" begins to form within the artery at its cut end, by the continued coagulation of blood. If all goes on favourably, the cut surface at the end of the artery, grows together (to use Hamilton's expression), in exactly the same way as in an ordinary wound, and the artery becomes permanently closed by a scar. "It must be clearly understood that, according to the views held by modern pathologists, the thrombus (internal coagulum) takes no more share in the production of the fibrous tissue than does the layer of blood-clot which cements together the surfaces of a wound. The thrombus is replaced by fibrous tissue, but not converted into it" (*Erichsen*). The tendency of the bleeding from an artery to become spontaneously arrested, being proportionate to the comparative quantity of the muscular fibres in the middle coat, will vary in inverse proportion to the size of the vessel. Practically speaking, this natural method of arresting hæmorrhage would be insufficient to save the animal's life, in the event of division of any of the large arteries. As a rule, an artery which has been cut straight across, will stop bleeding in a shorter time, than if it had been only partly divided; for in the latter case there will be only slight retraction of the separated parts within the sheath.

In almost all cases of a cut artery, the end nearest to the heart will be the only one of the two which will require to be closed. The scarlet colour of the blood and the jetting out of that fluid in harmony with the contraction of the left ventricle of the heart, will be characteristic of a wounded artery.

When an artery is tightly ligatured or twisted, the comparatively brittle internal and middle tunics become ruptured, and their ends retract and turn inwards, so that they offer resistance to the blood flow, and encourage the formation of the internal coagulum; while the outer coat being strong and tough, gives an effective support to the ligature, or closes the tube by remaining twisted on itself, as the case may be.

Torsion is preferable to ligature even for large arteries; for it is less apt to interfere with the healing of the wound, especially if the ligature be not of an antiseptic material which can be readily absorbed, and it can be quickly done by one person. The ligature, if used, should be of such a strength that it will not be absorbed before it accomplishes its special duty of keeping the vessel closed.

Besides the spontaneous arrest of bleeding by the constriction of the cut end, by its retraction within the sheath, and by the formation of an external and internal coagulum; the stoppage of hæmorrhage will be greatly aided by the animal becoming faint from loss of blood, in which case the rapidity of the flow will be reduced by the action of the heart becoming weaker, and the tendency of the escaping blood to form a clot will be proportionately increased.

The *application of styptics* (oil of turpentine, solution of perchloride of iron, for instance) checks bleeding by causing the blood at the seat of injury to coagulate. Hence, before employing them, all blood and clots should be removed from the wound.

The *hot iron* stops bleeding by forming at the end of the artery an eschar or crust, which appears, as a rule, to implicate all three tunics. Usually the hot iron is more effective in stopping hæmorrhage when it is at a dull red heat, than when it is hotter.

The *application of heat or cold* through the medium of water, tends to check bleeding by causing contraction of the muscular fibres of the middle coat of the arteries. The contractions produced by the employment of hot water (at a temperature of not less that 110° F.) begin quicker, last longer, and are more energetic than those induced by the use of cold water, the continued effect of which is to paralyse the tissues. The application of lukewarm water encourages bleeding.

For the arrest of bleeding, the application of warm water (120° to 125° F.) or cold water (or ice) is preferable to that of styptics (see above); because the use of styptics more or less irritates wounded surfaces to which they are applied. The employment of water in any of the forms just mentioned is free from this objection. It is obvious that irritation interferes with the healing of wounds.

Pressure on the seat of injury by means of one or more fingers, or by a hard pad and a properly arranged bandage will generally cause a clot to quickly form in a divided blood-vessel, and will thus stop the bleeding. The far too common practice of trying to arrest hæmorrhage in a limb by applying a tight bandage, handkerchief, or other form of tourniquet above the wound is wrong surgery; because such an appliance would induce more or less intense venous congestion, which, if long continued, might be followed by death of the part (gangrene), and would have little or no effect in producing the desired clot. We should here bear in mind that the walls of the veins are much thinner and weaker than those of the arteries, and are consequently much more sensitive to pressure, which, in the case under consideration, should be local, not general. The great use of a tourniquet is to prevent bleeding during a surgical operation.

"In wound treatment, pressure is a most powerful and beneficial agency. It favours union by maintaining accurate coaptation, and prevents extravasation of blood and its products. When such extravasation has occurred, pressure is the quickest, least painful, and the most successful agency in promoting absorption" (*Sampson Gamgee*). In all cases, pressure should be evenly distributed (as for instance, by means of cotton wadding, page 45), and should in no way interfere with the circulation or drainage of the part.

CHAPTER VI.

Wounds and Bruises.

ANTISEPTICS—ANTISEPTIC SURGERY—GENERAL TREATMENT OF WOUNDS—ABSCESS—CONTUSIONS AND BRUISES—OVER-REACHES—BRUSHING—SPEEDY CUTTING—LEGAL ASPECT OF CUTTING—WOUNDS ON OR NEAR JOINTS—BROKEN KNEES—WOUNDS OF THE MOUTH—PUNCTURES FROM THORNS, ETC.—SADDLE GALLS AND SORE BACKS—HARNESS GALLS—POLL EVIL—BURNS AND SCALDS—WOUNDS OF THE ABDOMEN—WOUNDS OF THE CHEST—BLEEDING AFTER CASTRATION—PERITONITIS—STROKE OF LIGHTNING—FROST-BITE—INFLAMMATION OF VEINS—INFLAMMATION OF THE TESTICLES FROM INJURY.

Antiseptics.

The following are some of the best fluid antiseptics:—

CREOLIN OF JEYES' FLUID (p. 609), at a strength of 1 in 50 (1 drachm to 6¼ oz. of water), would be strong enough for application to healthy or recently-inflicted wounds; and double that strength for suppurating wounds.

CARBOLIC ACID (p. 602) can be employed at the same strength as creolin. Before dissolving it in water, it is well to mix it with three or four times its weight or volume of alcohol (methylated spirits, for instance), which renders it more soluble.

CHINOSOL (p. 604). One grain to 1 oz. of water for healthy wounds, and double that strength for unhealthy ones.

PEROXIDE OF HYDROGEN (1 to 10 of water) is an admirable antiseptic, especially for open joints, and for abscesses, after removing their contents.

SANITAS is a proprietary preparation which consists of camphoric substances and peroxide of hydrogen. When diluted with from 5 to 10 parts of water, it forms a valuable antiseptic.

BINIODIDE OF MERCURY (p. 620).

BORIC (BORACIC) ACID (1 to 20 of water) makes a feeble antiseptic lotion which has the advantage of being entirely unirritating. For foul wounds, a saturated solution should be used.

BICARBONATE OF SODA (baking soda) closely resembles boric acid in its action as an antiseptic, and can be employed at the same strength.

OIL OF TURPENTINE.—Mr. Banks ("Liverpool Med. Chir. Journal," July, 1889) states that "some agents, like the perchloride of iron, are admirable styptics, and some, like iodoform, chloride of zinc and carbolic acid, are most effective antiseptics; but I know of no remedy which combines the two properties to the same extent as common turpentine, while at the same time acting as a direct stimulant to healthy granulation. The only objection that can be urged against its use is that it may be painful. In the case of a clean cut wound it is painful for some hours, but its application causes no suffering at all in the case of old wounds, sinuses or abscess cavities. The single word of caution in employing it is to see that it does not come on the skin, which it blisters. There is no remedy at all to be compared to it in its power of cleaning up old sinuses or sweetening sloughing wounds." Its cheapness and the ease with which it can be usually obtained are advantages in its favour which are well worth remembering

EUCALYPTUS OIL is an excellent application to sores and unhealthy wounds. In this respect its value will be increased by adding to it as much iodoform as it will dissolve.

CHLORIDE OF ZINC, when used at a strength of 40 grains to 1 oz. of water, is an admirable application for foul wounds which cannot be regularly dressed, as it will keep them healthy for three or four days. It is irritating to the skin, but has the advantage of not being volatile.

PARAFFIN OIL is a good antiseptic for sores and unhealthy wounds, but should be used sparingly, as it will irritate the part, if employed freely. It is easily obtainable.

Although CORROSIVE SUBLIMATE (mercuric chloride) is largely used in surgery, I do not include it in the above list, because it coagulates albumin, which is a large constituent of the blood and tissues, and is consequently apt to form clots which would serve to protect putrefactive matter from its antiseptic action. The albuminate of mercury which is thus formed has no antiseptic power. Also, corrosive sublimate solutions have very little pene-

trating effect on fat. Consequently, this salt of mercury is not a reliable antiseptic. As carbolic acid does not coagulate albumin and as it readily combines with fat, a solution of it is particularly effective for cleaning the seat of an operation. Corrosive sublimate is used at a strength of from 5 to 10 grains to a pint of water.

It is well to remember that ordinary oil has a protective action on bacteria, and is consequently much inferior to water, vaseline, or glycerine as a "vehicle" for an antiseptic. For this reason, the once popular carbolic oil is now seldom used. In its place, I would recommend the following application which I have devised for open wounds and sores, especially in hot climates—

Carbolic acid	1 oz.
Camphor	5 ,,
Resin or shellac	1 ,,
Methylated spirits	15 ,,

The carbolic acid is an antiseptic; the camphor is a sedative; the resin leaves a fine coating over the part to protect it; and the carbolic acid and camphor prevent flies from lodging on it, but only for a few hours, as both these drugs are volatile.

As a DRY ANTISEPTIC DRESSING, we cannot do better than to employ tannoform (p. 625), iodoform (p. 612), or equal parts of iodoform and tannin.

Antiseptic Surgery.

In operations with the knife, there are two courses open to us. First, when the wound is in healthy tissue, and when we are able to dress it, and to keep it dressed, under thoroughly antiseptic precautions, so as to obtain union without the formation of matter (pus). Second, when we cannot obtain this favourable result in its entirety, in which case we should try to bring about repair in the best possible manner.

When adopting strict antiseptic methods, we have, during the operation and until the part has resumed its ordinary power of resisting infection, to prevent the entrance into the wound, of germs or other material which might injuriously affect the health of the wound, or the general health of the animal. The application of antiseptics to a wound in healthy tissue is a necessary evil; for if we could keep the part in a state of absolute cleanliness without their aid, the wound, being free from their more or less irritating effects, would heal quicker than if they were used. In veterinary surgery, when using the knife at all freely, we can very rarely dispense with the employment of antiseptics, supposing, of course, that our object is to get the best possible result. Even if the antiseptic or antiseptics do not completely succeed in their object,

they will certainly induce the wound to heal quicker and in a more healthy manner, than if they had not been employed.

When carrying out the usual routine of strict antiseptic precautions in an operation, we begin, after having put on a clean linen overall, by washing the skin that covers the part in which the incision is to be made, with warm water and carbolic or other antiseptic soap; keep applied to it for about five minutes before the operation, a solution of carbolic acid (1 to 20 of water); and thoroughly wash—using warm water, soap, and a nail-brush—the instruments to be used, and keep them in a similar carbolic solution for at least five minutes before they are required. The operator's hands (particular care being taken to clean the nails) should be also disinfected with warm water, soap, nail-brush, and carbolic solution. Before making surgical wounds, the hair should be shaved off, and the skin of the part carefully disinfected; for the glands of the skin and hair follicles form nests for bacteria, which obtain a protective covering from the greasy matter of the skin. Besides using soap and washing soda to remove this fat, we might eliminate any remaining particles of it by the application of ether. While performing the operation, the instruments and operator's hands (both having been purified in the manner just described) should not be allowed to touch any object which has not been equally well disinfected. The hands, if necessary, may be dried with antiseptic cotton-wool, and the instruments laid out on a thick and folded towel which has been boiled in water and soaked in a 1 to 20 carbolic solution. The use of sponges is not advisable in veterinary surgery, for they are difficult to keep clean. If they be employed, they should be previously washed with washing soda, and kept in a 1 to 20 carbolic acid solution. Antiseptic cotton-wool can be used instead of a sponge, and is easier to keep clean. If it be required, it should be kept in the carbolic solution, and after it has been employed it may be thrown away.

The easiest way to disinfect instruments, supposing that they have metal handles, is to put them into boiling water for about five minutes, after having cleaned them.

To arrest bleeding we may proceed as directed on pages 71 and 72. Any ligatures used in tying cut arteries should be of prepared catgut, silk thread or horsehair. The two last mentioned should be steeped for some time in the carbolic acid solution before being employed. To stop oozing of blood in a wound, we can use pressure with a pad of antiseptic cotton-wool. Or we may apply water at a temperature of from 120° to 125° F. (p. 65). If the oozing continues, we should let the wound dry before closing it up After the wound has ceased bleeding, it may be washed with carbolic solution and then covered up with tannoform or iodoform. We may place over this eight or nine layers of clean, soft cotton cloth which has, if possible, been previously boiled, soaked in the carbolic solution, and slightly wrung out, so as to deprive it of an excess of moisture. As carbolic acid is volatile, the whole should be covered over with mackintosh, or with gutta-percha tissue prepared for the purpose. For human practice, Lister recommends the double cyanide of mercury and zinc instead of iodoform, and as a covering, takes, say, 6 yards of unprepared absorbent gauze (to be obtained from any chemist), folds it lengthwise in eight layers, and soaks it thoroughly in the carbolic solution, after having dusted dyed double cyanide of mercury and zinc over one of the centre pieces of the gauze. He then rolls up the eight layers of gauze together, and kneads them with the fingers for a minute or two, so as to diffuse the salt (to an amount of about $\frac{1}{4}$ oz.) throughout the mass, as will be shown by the colour. This specially prepared dye causes the cyanide to adhere to the fabric.

Owing to the difficulty of keeping dressings on a horse, and to the unfavourable conditions under which we have often to treat the animal, we have, as a rule, instead of adopting the somewhat ela-

borate antiseptic precautions which I have detailed in the preceding paragraphs, to content ourselves by doing the best we can. If it be not practicable to cover over and bandage the wound, we may apply dry tannoform or iodoform; dry boric acid; eucalyptus oil in which as much iodoform as it will take up, has been dissolved; plain eucalyptus oil; or burnt alum. If the wound continues healthy and dry, it should not be interfered with; but if matter (pus) forms, it should be washed two or three times a day and an antiseptic put on. My own practice in such cases, is twice or thrice a day, to wash away the pus with warm water and a syringe, and when the wound is clean, or as clean as I can get it, to wash it over with a solution of carbolic acid, creolin or chinosol (in the respective strengths mentioned on page 67); finally to apply a dry dressing of tannoform, or a saturated solution of iodoform in eucalyptus oil.

Supposing that after the operation the animal has to be "turned out" without further treatment, I would recommend, agreeably to Lister's advice, that the wound should be mopped over with a solution of chloride of zinc (40 grains to the ounce of water), and, if circumstances permitted, covered over with tannoform. If, owing to the position of the part, the tannoform could not be used in a dry state, we might apply a saturated solution of it in methylated spirits.

In the event of our having none of the foregoing chemicals at hand, we might clean our instruments by scrubbing them with a nail brush, and keeping them in boiling water for five minutes. Water which had been boiled, and then allowed to cool, might be used to wash the part before employing the knife, after cleaning the part with soap and warm water. The hands could be cleansed in the same manner. The addition of a teaspoonful of common salt to each pint of water, will cause that fluid to acquire slight, though appreciable antiseptic properties. The towels and cotton cloths, after having been washed, might be soaked in boiled water, taken out and dried in the air, and the wound might be dusted over with burnt alum or sulphur, if no more effective antiseptic be at hand.

General Treatment of Wounds.

1. STOP THE BLEEDING.—There is rarely much difficulty in doing this, if the bleeding be only from veins; water at a temperature of from 120° to 125° F., slight pressure, or the application of ice or snow being generally sufficient. We can know that an artery is cut, by the bright red colour of the blood, and by the manner in which it jets out. We should try to pick up the end of it nearest

to the heart, with a torsion forceps, draw it out, and give it about eight half twists, so as to form a twisted coil or knob that will aid in securing the vessel. If a ligature be used, it should be tied tightly by a reef knot (Fig. 32), with thread: silk for preference. We may then pick up and tie the other end. An attempt to twist or tie should always be made, when there is persistent bleeding in a jet. Bleeding from an artery may be often stopped by getting hold of the cut end from which blood is being pumped out, with the fingers, and exerting pressure on it for a few minutes; or by keeping up pressure on the side of the cut end with the finger, or a pad (p. 66).

"Above all, the surgeon should never dread hæmorrhage, nor lose his presence of mind when it occurs. If recourse be had to proper means, it can always be, at least temporarily, arrested. On no account should any one who pretends to the character of a surgeon, employ inefficient means to stop it, and imagine that he can, by covering up the wound with rags, handkerchiefs, &c., prevent the escape of blood. These procedures only hide the loss that is going on, and, by increasing the warmth of the parts, prevent the contraction of the vessels, and favour the continuance of the bleeding. Under all circumstances, therefore, bleeding wounds should be opened up, the coagula gently removed from their surface by means of a piece of soft sponge, or a stream of cold water and the part well cleaned. In this way you look your enemy in the face and can adopt efficient means for the permanent arrest of the hæmorrhage" (*Erichsen*).

2. REMOVE ALL DIRT, CLOTS OF BLOOD, AND OTHER FOREIGN MATTERS.—We may do this by gently syringing the part with recently boiled water which has been allowed to cool to about blood-heat; or, preferably, with a warm antiseptic solution, such as 20 grains of chinosol, or half an ounce of creolin or carbolic acid to a pint of water. A piece of antiseptic cotton wool, or a clean cotton rag soaked in an antiseptic solution should be used instead of a sponge, which is difficult to render thoroughly clean. We should avoid touching the wound more than is absolutely necessary. If the injury be superficial and the parts be not bruised, we may allow the blood to remain on, so as to form a scab, in which case, the process of healing will be greatly facilitated by dusting the wound with tannoform.

3. DESTROY ANY PUTREFACTIVE GERMS THAT MAY HAVE GAINED ACCESS TO THE WOUND, by the application of an antiseptic (p. 67).

4. BRING THE EDGES OF THE WOUND TOGETHER.—It is best in most cases, to bring the divided surfaces together, as soon as possible after the bleeding has ceased; or if by bringing them together and applying pressure, we can stop the bleeding. We may, however, have to leave the wound open for a few hours, especially

if it be deep, so that the discharge may escape. Before closing the wound, we should wash out, with an antiseptic solution (p. 67), any blood clots that may be in it; for their presence would interfere with the process of healing.

The edges of a superficial wound may be kept in contact by strips of ordinary adhesive plaster; or of cotton cloth covered with glue, or saturated with collodion. Shaving the hair round a wound is advisable, as it will help to keep the part clean.

Sutures (stitches for drawing together the edges of a wound), if possible, should be dispensed with; as they are apt to blemish, and are not very successful in horse practice: a fact that is probably owing to the difficulty experienced in keeping our patients at rest. Silver, or annealed iron wire of different sizes, made for the purpose, forms a good general suture for wounds, especially those which are

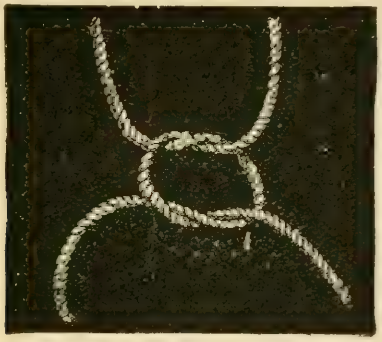


Fig. 32.—Reef knot.

likely to gape. They keep the part cleaner and they can be more easily tightened or loosened than silk thread or horse-hair, either of which may be made germ-free by soaking it in a solution of carbolic acid in water, 1 to 20, for a quarter of an hour. As an additional precaution, the silk thread might be previously kept in boiling water for a few minutes. Prepared catgut may be used for this purpose. Ordinary catgut is difficult to make free from germs, and is apt to dissolve in the tissues before its duties are fulfilled. The causing of tension, which, if continued, is certain to give rise to, or to increase already existing inflammation, and the formation of centres of putrefaction are the chief objections to the employment of sutures. We should avoid bringing the edges of the wound together, if by doing so, the divided surfaces, at a lower depth, will be liable to "bag out," and thus to form a pouch for the accumulation of discharges.

The two kinds of stitching usually employed are the interrupted and the twisted suture. Each stitch of the former is complete in

itself. The latter consists of a curved pin which is kept in position by thread twisted between the two ends in a figure of 8.

In making the stitches, the edges of the wound should be accurately brought together, in the natural position of the parts; care being taken to avoid any incurling of the skin. The wire, pin, carbolised catgut, or thread, as the case may be, should, with the aid of a pin director or curved needle, be passed through one side, and out at the other. The sutures should be about half an inch from each edge, about an inch from each other, and should go deep enough to obtain sufficient hold. While this is being done, the lips should be held together by an assistant. "The general rule is to tie the middle stitch first: this, however, is of no great matter. The chief precaution required is that they be introduced at correspondent opposite points, so that, when they come to be drawn tight, they meet each other in straight or parallel lines, and confine the sides of the wound evenly and uniformly together, without wrinkling the skin or giving the parts any harsh or unnatural constraint" (*Percivall*). If a suture be found to cause irritation, it should be at once removed. As a rule, sutures should not be kept in a wound longer than three days. If, however, the suture performs a useful end, and neither gives rise to irritation, nor becomes putrid, it may be left undisturbed.

5. OBTAIN REST.—This may be done by slings, splints, bandages, tying the horse's head up, the administration of chloral hydrate or Indian hemp, or even by applying a blister near a joint so as to prevent movement.

6. DRESS THE WOUND.—Already inflicted wounds should be dressed according to the same principles as those of operations (p. 69 *et seq.*). If the wound is suppurating—that is, if pus (matter) be present in it—we should endeavour to clean it thoroughly with warm water; disinfect it with one of the solutions given on p. 67, and then apply tannoform, iodoform, or a saturated solution of iodoform in eucalyptus oil. A suppurating wound will generally require to be dressed a couple of times a day. If bacteria have not gained entrance into the wound, our interference should be limited to guarding it against their invasion. In this case, the antiseptic employed should not be stronger than carbolic acid or creolin ½ oz. to the pint of water; a saturated solution of boric acid in water; or tannoform. After covering over the wound with five or six layers of antiseptic cotton wool, it may be left untouched for six or seven days, by which time it ought to have healed in a perfectly healthy manner, and ought to require no further special treatment. After having dressed the wound in the manner de-

scribed, we may get it to heal under favourable conditions, even when there is some discharge, by placing over it a thick covering of antiseptic wood-wool, or antiseptic cotton-wool, and keeping the entire dressing in position by a moderately tight bandage, the pressure of which will aid the cure by tending to bring the edges of the wound together. A good result can be expected from this method only when the antiseptic material is sufficiently thick to prevent the discharge, if it be present, from soaking through and thus becoming exposed to contamination from the outside air. If this occurs, the whole of the dressing should be removed, and fresh dressing applied. Before the days of antiseptic surgery, the French surgeon Guérin practised with much success the plan of applying evenly distributed pressure on wounds, after having cleaned and brought the divided edges together, by applying over the part a large amount of cotton-wool, and then putting a bandage over it. The dressing of the wound with iodoform, and the substitution of antiseptic wood-wool for ordinary cotton-wool, are valuable improvements on Guérin's method.

If we cannot obtain antiseptic cotton-wool, we may content ourselves with covering the wounded parts with iodoform, tannoform, or even with burnt alum.

Bandages are of use for preserving the proper position of the parts; but care should be taken that they are applied evenly, and not too tightly, so that their presence may not give rise to an unhealthy condition of the wound, from interference with the circulation of the blood. Evenly distributed pressure (with, for instance, cotton wadding, see page 45) by bandaging below a wound in the legs, often produces a very good effect by preventing stagnation of blood in the lower part of the limb, through which the blood that nourishes the leg has to pass before it can return to the heart.

If the part inflames, the sutures and bandages should be removed, and the part bathed from time to time with some weak antiseptic lotion (p. 67).

We may know that the process of healing is not going on in the desired manner, if we observe constitutional disturbance with rise of internal temperature (p. 681); discharge of matter; swelling and unusual heat of the part; and (which is a ready and reliable guide) a mawkish odour about the dressings. But if inflammation does not ensue to any marked extent, the wound should not be interfered with by fomentations, or lotions of any kind.

SECURE DRAINAGE.—Drainage is necessary, chiefly to remove putrid matter, and to prevent the wounded surfaces from being kept apart by the accumulation of discharges, etc. The free escape of such matters should be provided for, if possible, at the lowest point,

by an ordinary drainage tube, or, as suggested by Major Blenkinsop, A.V.D., by using a cord of six or seven long horsehairs which have been soaked for say half an hour in a 1 to 20 solution of carbolic acid in water. This cord may be passed through the wound as a seton.

APPEARANCE OF WOUNDS.—We may assume that a wound is healthy when it looks like a clean cut, or, as if a piece had been cleanly punched out of the flesh; unhealthy, when it is pale, and covered with pus, or small clots, and with large, soft granulations; inflamed or angry, when it is of a dark red colour with a good deal of heat; and indolent, when the process of repair appears arrested, as in a "sit-fast" (p. 102).

GENERAL REMARKS.—*Unhealthy and indolent* sores and abscesses are best treated, by, in the first instance, scraping away the pus-forming substance (granulating tissue) which covers or lines them. A Volkmann's spoon is an admirable instrument for performing this necessary operation, after which, the free use of turpentine (p. 68) or other suitable antiseptic would be advisable; or with an indolent sore, we might apply a hot iron over its surface, especially when its sides have become hardened, and have, to a certain extent, lost their vitality, as in old abscesses. When the wound is the seat of some noxious growth, as in "bursatee" (p. 145), we should render it healthy by the free use of the knife.

Inflamed wounds should be treated by continued bathing in, or with, warm water, or by poultices, so as to relieve the unusual tension, soothe the irritation, and hasten the process of repair by granulation. In all cases it is well to mix an antiseptic (p. 67) through a poultice; for, if this is not done, the poultice will tend to prevent repair by encouraging the growth of bacteria.

Punctured wounds are the most dangerous variety; as the undue retention of their contents is apt to give rise to serious inflammation, and to grave constitutional disturbance, from the absorption of putrid material. We may place under this heading, deep-seated wounds caused by the opening of an abscess. As a rule, the contents of such wounds should be syringed out three or four times a day, which may be done at first with lukewarm water, and afterwards with a weak antiseptic solution (p. 67). For this purpose, I have found Read's clyster pump very useful. It is well to have a thin bone pipe (somewhat similar to that of an ear-syringe and about 4 inches long) ready for use, in case the usual enema tube is too large. The drainage of these wounds should be carefully attended to. As it is very difficult to do this effectually when these wounds are deep, we can rarely hope that they will then, especially when caused by

an accident, heal in any other manner than by granulation. Hence in these cases, the free escape of pus should be provided for, by opening out the wound, if practicable; or by passing a seton through it. The part should be liberally bathed with a warm antiseptic solution.

If a *scab* which has formed over a sore be wounded, if it becomes loose before healing is complete, or if fluctuation can be detected under it, it should be removed by poultices, or by bathing in warm water, in order to allow the escape of pus, and the exposed surface should be treated with tannoform, iodoform, or some other suitable antiseptic. But if the wound under the scab be healthy, it should on no account be interfered with.

In the early stages of *bruises,* we may often, by the aid of massage (p. 664) cause absorption of the fluid which gives rise to the swelling, and thus arrest the formation of pus; but if suppuration has already set in, we must give vent to the pus by the knife without delay; for the longer it remains, the greater will be the destruction of the healthy tissue, which can never be replaced except by grafting, which is a difficult operation to perform successfully in the horse. We should have recourse to poultices only when the exact position of the pus is doubtful. That being determined, the knife should be used.

If the injury be accompanied by sympathetic fever, or if the horse be in gross condition, he should be put on bran mashes, and may get a dose of aloes or Epsom salts. But if he is in a debilitated state, his strength should be kept up by liberal feeding.

Abscess.

DEFINITION.—An abscess is a collection of pus (p. 15) enclosed within some portion of the body.

VARIETIES.—Abscesses may be divided into two kinds: acute, in which the inflammation is actively and manifestly at work; and chronic, in which the process of the formation of pus proceeds slowly and without marked symptoms of heat and tenderness, as in "bastard strangles" (p. 467).

The pus in an abscess may become circumscribed in a sac, or may spread indefinitely, until it gains an exit, or until it meets with some effective barrier. In the former case, the collection of pus is said to be a circumscribed abscess; in the latter, a diffuse abscess. An abscess may also become checked in its development, or may dry up, and after undergoing degeneration, may become more or less absorbed without further trouble.

I shall allude later on ("pyæmia," p. 532) to the constitutional

disturbance caused by the absorption of pus, or of the products of pus cells, into the circulation.

SYMPTOMS.—The local symptoms of an acute circumscribed abscess are tenderness, swelling, heat, throbbing, and "pointing." When pus has formed, the part, which was abnormally hard during the formation of the abscess, will become soft to the touch, and may "pit." The presence of a chronic abscess may become apparent by the swelling and fluctuation of its contents.

The symptoms of an acute diffuse abscess (*diffuse cellulitis*) somewhat resemble those of human erysipelas. I have seen in a horse, several deep-seated abscesses form between the fore limb and chest, in the arm-pit and underneath the lower part of the shoulder blade; the cause being infection after firing the back tendons of the leg. The first symptoms were pain and throbbing of the tissues immediately above the abscess which was in course of formation, and great swelling and tenderness of the leg from that part downwards. In two or three days the swollen surface was doughy, that is, it left a mark similar to what dough would do if pressed upon with the finger. But there was no pus near the surface; for when the skin, with the object of relieving tension, was cut through with the knife at various parts, the wounds, which had the appearance of yellow, moist cheese, exuded only orange-coloured serum, more or less mixed with blood. The swelling of the limb rapidly became enormously large and very painful, until an abscess was opened, when the swelling soon subsided, only to re-appear on the formation of the next abscess.

PRINCIPLES OF TREATMENT.—I have had admirable results in the treatment, among human beings, of boils—especially, those of undoubted parasitic origin in India—by the frequent (say six or seven times a day) application to the part, of eucalyptus oil, which, when used early, checks the formation of pus, seemingly by acting on the bacteria which accompany it, with the result that instead of an abscess appearing, little or no pus forms, and the part soon regains its normal condition. A valuable peculiarity in eucalyptus oil is that, although it has only a slightly irritating action on the skin, it has a powerfully repressive effect on bacteria. We all know that a blister applied over a superficial abscess which is forming, stimulates the part to healthy action. I think we may go further, and say that under its influence far less pus becomes accumulated than if the natural course of the abscess had not been interfered with, or if the part had been poulticed or fomented with warm water, either of which processes aid the development of pus. As the presence of pus favours the destruction of tissue, and may set up blood poisoning, we should try to prevent it forming; or, if this cannot be done, we should try to remove it. Exposing a tissue in which pus is forming to the action of the air (in other words, prematurely opening an abscess), generally gives rise to unhealthy action in the part. Referring to human surgery, Watson Cheyne (Treves' "System of Surgery") advises: "When once it is certain or probable that pus is present, means must be taken to open the abscess without further delay, and to provide a free exit for

the pus. There is no object whatever in permitting an acute abscess to go on till it reaches the skin. To do so is simply to allow the formation of a much larger cavity, and the consequent destruction or interference with the tissues in the neighbourhood; and if it should happen that pus is not found on making the incision after all, the best thing has been done with the view of cutting the inflammation short." But, as Cagny and Gobert wisely remark, "We should seize the proper moment. Too much haste may impede the recovery, and sometimes the swelling may persist after the incision has been made. We may avoid these troubles if we open the abscess when the fluctuation can be felt in at least two-thirds of the tumour. There are cases when it should be opened early, as, for instance, in deep abscesses in muscles and near joints, and especially when there is danger of pressure on an important organ, as in the case of an abscess which interferes with the breathing." Agreeably to the foregoing remarks, we may treat abscesses according to the following principles: check the formation of pus; remove it when it has formed; render the cavity healthy; and encourage the wound to heal.

PRACTICAL TREATMENT.—When an abscess begins to form, we may try to check its development by the frequent application of eucalyptus oil, oil of turpentine, or a blister of biniodide of mercury ointment (1 to 8). If pus has collected, we should, if practicable, treat the abscess under as strict antiseptic precautions as we are able to adopt. With this object, we may, by means of an aspirator, remove all the pus by alternately withdrawing fluid and pumping in water; render the cavity free from putridity by filling it with an antiseptic solution, preferably, one of hydrogen peroxide (p. 67); and after withdrawing the needle of the aspirator, cover the part with five or six layers of antiseptic cotton wool, over which gutta-percha tissue may be placed, so as to exclude putrefactive germs. This dressing may be kept in its place by a bandage. We can then hope that the part will heal in about a week's time without the formation of any more pus. An aspirator is a form of syringe or pump, provided with a hollow needle by means of which fluid can be drawn off from or pumped into a closed cavity, like an abscess, for instance, while preserving the cavity from the admision of air. If we have neither the opportunity nor the appliances for treating the case according to the foregoing model manner, we may follow it, as nearly as possible, by using a syringe instead of an aspirator, after opening the abscess with the knife. If pus continues to form, though in decreased amount, we may have to wash out the cavity by injecting the antiseptic solution (whichever one we use) at least twice a day, and it may be advisable to fill up the cavity with antiseptic cotton-wool, which should be changed each time the injection is employed. A saturated solution of iodoform in ether or in eucalyptus oil might be tried. If these means be not sufficient to ensure drainage, we may have to pass a seton through the lowest point at which fluid collects. Any portions of dead bone or other foreign body should be removed; for if allowed to remain, its presence will probably keep the part in a

suppurating condition. If the abscess assumes a sluggish course, it will generally be advisable to stimulate it by a biniodide of mercury blister applied to the skin of the part.

As a rule, when opening an abscess, it is well to use a Symes' abscess knife, which has a fine, sharp point, and curved blade. This knife should be held firmly between the forefinger and thumb at, say, three-quarters of an inch from its point. The animal being secured, the point of the knife is driven into the selected part, and the cut made. If, after doing this, the contents of the abscess do not come out, we may give them vent by inserting the forefinger or probe into the wound and trying by its means to give a passage to the imprisoned fluid. Either an ear syringe or Read's clyster pump, fitted with a thin nozzle, will generally be useful for washing out the cavity with an antiseptic solution.

Contusions and Bruises.

A contusion is an injury, due to external violence, of parts beneath the skin, without division of the skin. It "may be looked upon as a subcutaneous wound" (*Erichsen*). A bruise, which is a somewhat vague term, may be regarded as a superficial contusion.

For practical purposes we may divide contusions into two kinds: (1) those in which there is effusion beneath the skin, without marked injury to the parts beneath it; and (2) those in which the tissues below the skin are more or less severely hurt. In a contusion there will always be rupture of at least some of the smaller blood-vessels. Hence the effusion or swelling will consist of blood as well as of serum. The usual causes of contusions are blows and unequally distributed and prolonged pressure.

In repair of a contusion we may have absorption of the effusion, the formation of adhesions, and the formation of pus, either simply or combined. In all cases of contusions, hand-rubbing (p. 664) and evenly distributed pressure, as, for instance, with cotton wadding (p. 45), act well. In mild cases, we may trust to stimulating the superficial circulation to remove the effusion, by rubbing into the part with the hand a small quantity of spirits, such as brandy or whisky. If we think that such simple means will be unavailing to prevent the formation of pus, it will be well to check the process as far as possible by the application of an antiseptic, of which we have an admirable example, for this purpose, in eucalyptus oil. Turpentine will act probably as well; but it produces a severer effect on the skin. The well-known action which counter-irritants, such as biniodide of mercury in the form of ointment, have in aborting or in staying the progress of abscesses, is probably due

more to their antiseptic influence than to their effect in stimulating the circulation. It is manifest that considerations of work will generally have their weight when deciding as to the remedy. For instance, if we are anxious not to put on the sick list a horse which is suffering from a recently inflicted contusion on the withers, owing to an ill-fitting saddle, we would naturally be inclined to try the effect of friction with spirits, rather than that of an agent which would more or less blister the skin.

If pus forms, we should give it vent with the knife, and should treat the injury as an open abscess. Bathing and fomenting the part with warm water should not as a rule be employed in the early stages of contusions; as these operations encourage the formation of pus.

We have familiar instances of contusions in enlarged knees, and bumps on shins and fetlocks from knocks when jumping timber out hunting; in swollen withers from pressure of the gullet plate of the saddle; in capped hocks from kicking; and in capped elbows from pressure of the heels of the shoes. It is evident that when removal of the cause is possible, it is the best treatment.

Over-reaches.

An over-reach is a wound or bruise caused by a hind shoe or hind hoof striking a fore leg. In the shod horse, it is generally inflicted by the inner edge of the toe of the hind shoe; and the wound will then, as a rule, take the form of a flap. In exceptional cases, particularly when leaping, it may be made by the front part of the toe of the shoe, in which event, it will almost always occur above the fetlock.

The seat of injury is usually (*a*) on the soft horn just above the heels; (*b*) on the coronet a little in front of the heels, that is to say, on the rear portion of the inside or outside quarter; or (*c*) on the back tendons.

If we study the illustrations in the chapter on the paces in "Points of the Horse," we shall see that in the canter or gallop an over-reach can occur, under ordinary conditions, only on the leading fore leg. In the leap, also, this leg, as shown in the same book, is far more liable to this injury than the non-leading leg; as, in almost all cases, it is the one which, on landing, is the first to be brought down, and which has to bear the whole weight of the body, until the other fore leg is carried beyond it and placed on the ground. The walk and the amble are the paces at which the horse is, manifestly, least liable to over-reach. In the trot, both fore legs are equally liable to injury from a hind one. Unless in the case of a horse being thrown off his balance, the hind foot which inflicts the

injury, will always be the one on the same side as the wounded leg. From the foregoing considerations, we may see that when an over-reach occurs, it will have been caused by the injured fore leg not having been lifted off the ground in time to make way for the hind leg which followed it. Hence, this accident is usually brought about by some mechanical impediment—such as that caused by stepping on soft, irregular, or slippery ground—or by weakness or inability on the part of the horse.

Fig. 33.—Blackwell's india-rubber guard to prevent over-reaching and brushing on the coronet.

Preventive measures may be employed by regulating the movements of the horse, or by adopting mechanical precautions.

Under the first heading, our care, as a rule, should naturally be to teach the horse to carry himself during movement, in such a way that more or less of the weight on his forehand will be transferred to his hind quarters; in other words, to "lighten" his forehand, so as to make him readily lift his fore legs out of the way of the hind ones. The methods to attain this end are described in "Illustrated Horsebreaking," and consist in making the animal rein-back, circle, change his leg, and perform other school movements

in a "collected" manner, both with the "long reins" and when mounted. We should carry out the same principle when riding or driving the animal. In this endeavour, we should stimulate him to go on, and at the same time hold him in, so that the movements of his fore legs being checked in a forward direction, will be increased in an upward one.

As precautions in shoeing, we may get the inner edges of the hind shoes, at the toes on the ground surface, bevelled off; and the hind toes made "square" by putting square-toed shoes, with side clips, on the hind hoofs, the toes of which are then rasped flush with the

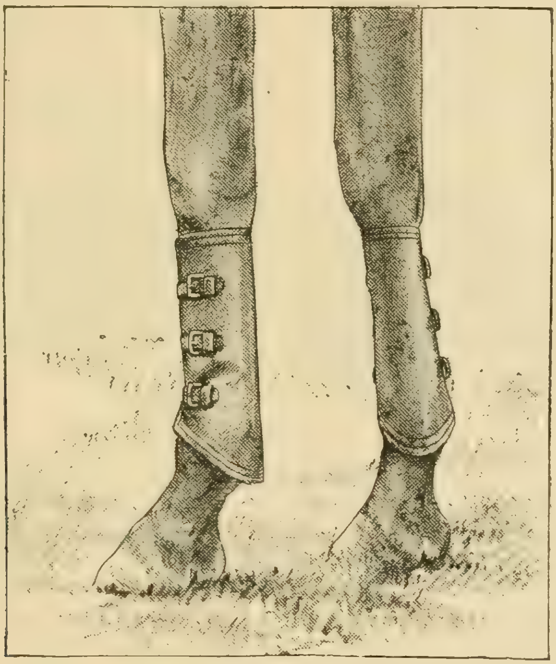


Fig. 34.—Over-reaching boots on horse.

toes of the shoes. Many American authorities recommend for trotters that over-reach, the use of heavier shoes in front than behind, say, ones of 14 oz. and 6 oz. respectively. Their employment often improves the action so much, that ordinary shoes can be resumed later on. Blackwell's india-rubber guards (Fig. 33), which are made to encircle the pastern and hang down over the part liable to injury, are very useful for preventing over-reaching on the heels. The employment of bandages or boots is self-suggestive to every careful horseman, when practising a horse at jumping water, especially if the ground on the landing side is soft. For this purpose a good pattern of strong leather boot, which should be lined with cloth, is shown in Figs. 34 and 35.

TREATMENT.—If the wound be just above the heels, our chief object will be to prevent moisture getting on the part, which is so akin to horn that the action of water on it would tend to decompose it. Hence, we should remove any jagged ends that may be present, as the fluid resulting from their decomposition would irritate the wound; and we may apply tincture of myrrh, tincture of arnica, or the carbolic and camphor application given on page 69. The spirit contained in these agents, will, on evaporating, leave a resinous covering which will exclude damp, and will also stimulate and dry up the cut. If these applications be not at hand, we may use a saturated solution of camphor in turpentine, turpentine (p. 68), or ordinary spirits. The part should be kept dry and should not be washed. When the over-reach is just above the heels, the horn which is immediately below the wound, should be pared thin, so as "to allow it to expand to the swelling which occurs in the injured

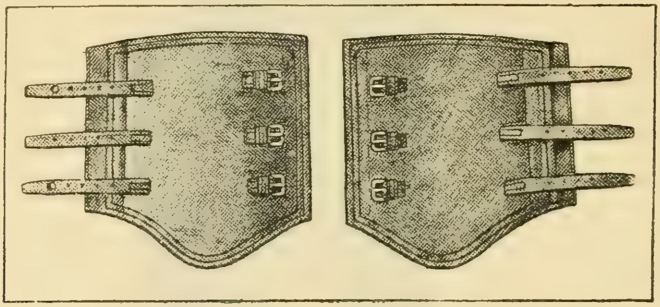


Fig. 35.—Outside view of over-reaching boots.

parts" (*Fleming*). If the heels be much bruised, the injury may be bathed in warm water or poulticed for a short time.

If the coronet on one of the quarters of the foot be wounded, there will generally be separation, to the depth, perhaps, of half an inch, of the horn of the hoof from the coronet immediately below the injury, in which case, the whole of the separated horn should be removed, as in Fig. 36, by the "drawing knife," so that any discharge there may be from the wound may not collect in the recess thus formed, and, also, that the edge of horn thus left, may not press upon and irritate the wounded tissue, when, as a consequence of inflammation, it will have become swollen. In any case, I think it well to pare away the horn below the injured coronet. The wound itself may be treated in the same manner as that described in the preceding paragraph.

When an over-reach is on the back tendons, the injury may be confined to the skin, or may also involve, more or less seriously, the tendons themselves, in which case the usefulness of the animal may be permanently impaired. The treatment will here be that

of a wound, with special attention to the preservation of tissue; hence the process of suppuration should be checked as much as practicable. Unless dirt is seen to have gained entrance into the wound, I would advise that the part should not be washed. If bathing be imperative, it would be well to use one of the antiseptic solutions given on p. 67. I do not see any good in using sutures (stitches).

Fig. 36.—Removal of horn near coronet, after over-reach on quarter of hoof.

A high-heeled shoe (Fig. 4, p. 27) will be useful for keeping the back tendons at rest. If the wound be very serious, the animal may be put in slings and may be bedded down with sawdust, so that he may readily place his foot in any easy position. In treating the wound, I like to freely dust it over with tannoform or iodoform; cover it with four or five thicknesses of antiseptic cotton wool; and apply cotton wadding and a calico bandage, as in a case of sprain (p. 45), with evenly distributed and judiciously regulated pressure. No possible harm can ensue from the presence

of the cotton wadding bandage unless it be put on too tightly, or unless the resulting pressure be unevenly distributed. Either of these untoward consequences will be apparent after a few hours, by the fact of the heat and swelling of the part becoming greater than what would be due to the ordinary course of inflammation. If such signs of irritation become manifest, the bandage should be altogether removed, or re-applied in a proper manner. Supposing that all goes well, the calico bandage and the cotton wadding may be taken off after twenty-four hours. If the antiseptic cotton wool which was applied to the wound be found to be dry and sweet smelling, we should again put on the wadding and bandage. The wound may be thus examined once a day. After, say, five days, or if there be oozing or bad smell from the wound, the antiseptic cotton wool should be removed by gentle bathing with tepid water; tannoform may be again dusted over it; and the antiseptic cotton wool re-applied and kept in position by a suitable bandage. If the wound still continues to suppurate, it may be rendered healthy by the application, say, twice a day, of a 10 per cent. solution of hydrogen peroxide (p. 67), a little turpentine (p. 68) saturated solution of camphor in turpentine, burnt alum, or some other suitable agent. If a scab forms and if pus appears underneath it, the scab should be removed by bathing with tepid water, or it may be gently picked off, and the part stimulated by one of the applications just mentioned. If the treatment which I have indicated cannot be followed out in its entirety, it can be modified according to the principles laid down in pages 71 to 77. As soon as the horse can be walked without his showing any marked symptoms of lameness, I think it well to begin to exercise him with every proper precaution, so that adhesions may not be allowed to form to an extent that would interfere with his usefulness. If the injury be on the off fore, it is well to give him his exercise in a circle to the left, and *vice versâ;* for by doing so, we shall, as much as possible, keep the weight off the bad leg. During recovery after a severe blow on the back tendons, we should be very careful not to allow the horse to lead with the injured leg, in the canter or gallop; for not only would it, when leading, have to bear more weight than the non-leading fore leg, but in its weakened condition, it will also be less able than before to get out of the way of the hind foot on the same side. Properly applied pressure, as with a cotton wadding bandage (p. 45), is invaluable in the treatment of this accident, not only for reducing swelling and for bringing the divided parts into contact, but also for causing the wound to take on healthy action.

Brushing

is caused by the outer edge of the inner quarter of a shoe, or, sometimes, by the rough clenches of its nails, wounding the opposite leg, generally on the fetlock. Sometimes the injury is inflicted higher up; or on the coronet; or even on the hoof. Owing to its retired position, the pastern is seldom hurt in this manner.

It may be due to weakness, in which case, with increased strength, the habit frequently leaves the animal; to fatigue; to defective conformation, especially when the horse "turns out his toes;" to the fact of the outer portion of the foot being higher than the inner, an arrangement which will cause the fetlock joint to be inclined inwards; to the irritating presence of mange insects (*symbiotes*, p. 136), which prompts the animal to hit and scratch his legs; etc.

PREVENTIVE MEASURES.—When brushing is caused by the fact of a horse turning out his toes, lowering the wall of the outside portion of the foot which gets hit, will generally serve to remove the fetlock out of the line in which the offending foot moves, and is, I have found, a better plan than thickening the inside half of the shoe. The wall of the foot which inflicts the wound should not be thinned by rasping, which would weaken a part that is intended to bear weight. Lowering the toes of the hoof, and leaving the heels alone, so as to make the foot more upright, will also help as a rule to prevent brushing. With this object in view, the horse may have to be shod, or his shoes removed, once every three weeks. Horses will rarely brush, if allowed to go bare-foot, or if shod with light tips.

If these measures do not succeed, a boot somewhat similar to an over-reaching boot (Figs. 34 and 35), but shorter and made so as to specially protect the fetlock joint, or a thick india-rubber ring may be worn. A guard may be constructed out of a bit of woollen cloth about a foot broad, with a piece of tape sewn on to it and placed in the direction of its length. Two or three turns are taken round the fetlock and leg, care being observed to keep all the turns on the same level. The tape is now passed round the leg and tied in a knot (Fig. 37), and the upper part of the cloth is turned over the lower half, so as to form an efficient boot (Fig. 38). The tape should be attached nearer to the lower edge of the cloth than to the upper edge, so that when the cloth is turned down, its two edges may be on the same level. The use of this cloth boot should only be a temporary measure; for the pressure of the tape, if continued, will be apt to leave a mark on the hair. Blackwell's guards (Fig. 33) are very useful with horses which brush on the coronet.

When brushing is due to bad shoeing, or to the presence of mange insects, removal of the cause will be the best preventive measure.

TREATMENT.—In slight cases, the application of some antiseptic dressing (p. 67) will be sufficient; but if the wound be inflicted on a previous "brush," the part should be poulticed until the scab comes off, and then treated with an antiseptic, such as tannoform, iodoform, friars' balsam, eucalyptus oil, or the carbolic acid and camphor application given on page 69. The same course should be observed when much inflammation is present.

Speedy Cutting

is the act done by a horse when he wounds the inside of one leg, near the knee, or hock, by, respectively, the other fore or hind foot. In the vast majority of cases, the injury is inflicted on a fore leg; although I have known horses speedy cut on both hind legs just below the hocks. Some make a compromise between brushing and speedy cutting by hitting themselves on the side of the cannon bone midway between the knee and the fetlock.

The term "interfering" is sometimes applied to both brushing and speedy cutting.

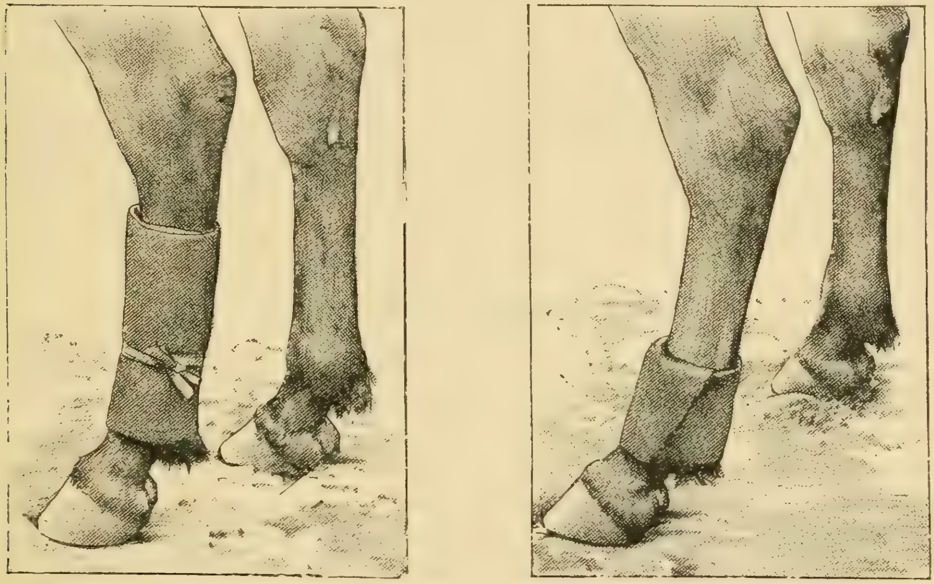
The seat of the injury is generally a little below the knee; although it may be just above it on the internal lateral prominence of the lower extremity of the bone of the fore-arm (the radius). These lateral processes are particularly prominent in blood horses. Their office is to give attachment to the lateral ligaments of the knee joint. Speedy cutting is generally met with among well-bred animals with free action. The wound is usually inflicted in the gallop, or when the horse is dancing about from restlessness. Horses which turn their toes out, are particularly prone to speedy cutting as well as to brushing (see remarks under that heading). I have seen a case in which the liability to speedy cutting was due to a "knock-kneed" condition of the affected limb, which, naturally, brought it into the line of action of the opposite foot. As the toes were not turned out, I had no remedy to suggest, except that the animal should not be used at fast paces. Horses, as a rule, do not speedy cut in the gallop, until they begin to tire.

Before purchasing a horse which we may require for fast work, we should examine its legs to see if there be the marks of old speedy cuts, and also whether there be any signs—as, for instance, the hair being rubbed—of the animal having worn a speedy cutting boot. A bony deposit of more or less extent will often be found on and around the spot at which a previous speedy cut has occurred.

Speedy cutting is not only a cause of disfigurement; but is also

extremely dangerous to the rider, especially when jumping, and should consequently be a disqualification, as a rule, to a hunter; although a chaser which is liable to hit himself in this manner, may be got to do his work by the aid of boots, without accident.

The preventive measures are of a nature similar to those for brushing. The speedy-cutting boot should come high up on the side of the knee, if the defective action is in front, which is almost always the case in animals given to this fault; for the bony prominences at the inside of the knee may get hit with disastrous results to the animal or its rider, or to both. The boot should be of fairly stout



Figs. 37 and 38.—Cloth boot to prevent brushing.

leather, and lined with some soft material, such as felt, to take off the jar of the blow. Much can be done in checking the tendency to speedy cut, by good breaking and capable riding, so as to make the horse move in a well collected manner. Sometimes, removing the shoe and adjusting the "bearing" surface, say, every three weeks, will prevent this injury. Lacombe's pad (sold by Willows, Francis and Butler) acts well with horses which are liable to speedy cut and brush, as it can be made to cover the portion of the shoe that inflicts the blow.

Young horses which speedy cut may subsequently abandon the habit as they grow older and stronger.

SYMPTOMS.—Heat, swelling, with more or less fever and pain. In two or three days an abscess may appear. Sometimes, the part is wounded rather than bruised.

TREATMENT.—If pus be present, free vent should be given to it by the knife, and the part bathed and afterwards treated with an antiseptic (p. 67). In the case of a severe blow which we may expect will be followed by an abscess, it is well to give at first a purgative; to keep the animal on laxative food (unless he is in a debilitated state); and to foment the part with warm water repeatedly before opening. If, after some days, when all heat and inflammation have ceased, we find that the swelling feels as if it contains fluid, we should open it by a horizontal incision at its lowest point—so as to allow the hair to grow over the subsequent scar—then apply an antiseptic (tannoform, for instance), and bandage with cotton wadding as in sprain (p. 45), so as to induce absorption by pressure. Sometimes, even after the sac has been opened, it becomes hard from the exudation becoming organised. In order to break up this deposit, we may determine an increased supply of blood to the part by repeatedly blistering it with biniodide of mercury ointment (1 to 8 of lard). A seton is not admissible, for it is liable to thicken the skin and thus leave a blemish.

Legal Aspect of Cutting.

Under this heading I wish to include speedy cutting, brushing, tread, interfering, and over-reaching. The case of Dickinson v. Follett, Exeter, 25th July, 1833 ("Moody and Robinson's Reports," vol. 2, p. 299) is the only one I can find on this point, and is as follows:—"The warranty was admitted. The horse had been kept and used by the plaintiff as a carriage horse (for which purpose he was bought) about a month, and was then tendered to be returned as unsound. It was admitted that the horse was unsound at that time, but there was conflicting evidence whether the unsoundness existed at the time of the sale, or whether it arose from some subsequent cause; and, on the other hand, a veterinary surgeon, called for the defendant, after giving his opinion that the lameness arose from a recent injury, stated also, that the horse was so ill-formed, from turning out one of its fore legs, as to be incapable of work to any extent without cutting, so as to produce lameness.

"Follett, in his reply, contended, that at all events the horse was unsound from this malformation; that a horse so ill-formed as to be incapable of the ordinary usefulness of a horse was unsound.

"Anderson, J., in summing up, said that the horse could not be unsound in law, merely from badness of shape. As long as he was uninjured, he must be considered sound. When the injury is produced by the badness of his action, that injury constitutes the unsoundness. His lordship then put the other parts of the case to the jury, who found a verdict for the defendant."

Although the foregoing dictum appears to settle the subject of "cutting" in a clearly defined manner, still, if we take into consideration the more recent rulings on Holyday v. Morgan, 2nd Nov., 1858 ("Law Journal," vol. 28, part 2, p. 9, New Series) and Coates v. Stephens ("Moody and Robinson's Reports," vol. 2, p. 158), we must admit that a horse should be regarded as unsound, if he is less than reasonably fit for immediate use, for instance, on account of his habit of cutting. This would especially apply to horses required for cross-country work, at which, animals given to the fault in question might be most dangerous to ride. Besides, I hardly think that a horse which required the employment of special precautions, such as a peculiar method of shoeing, or the wearing of "boots" to prevent him from cutting himself, could be deemed sound. I would therefore, in my capacity of veterinary surgeon, pass, as sound, a horse which had marks of cutting, only after finding that he did not "cut" during a searching trial, such as a day's hunting, or a fairly long day's journey.

Wounds on or near Joints.

The great danger to be feared from these wounds, is the formation of open joint, which is one of the most serious accidents that can happen to a horse; for the sufferer is apt to die from the ensuing constitutional disturbance, and even if he recovers, there is a strong probability that he will have a permanently stiff joint.

These injuries usually occur on the knee, fetlock, or hock, and are generally caused by falls, kicks, or by inexperienced persons probing about a joint which has been hurt. No unnecessary probing of a wound near a joint, should be allowed on any account; for even a very slight extension of the wound may open the joint.

SYMPTOMS.—If the joint has not been opened or severely injured, the wound will have an ordinary appearance, except that there may be a flow of synovia (joint oil), which may take place from wounded synovial sacs without the joint having been penetrated. In a case of inflamed open joint, the discharge becomes more and more unhealthy, until at last, it becomes mixed with matter (pus) and blood, and assumes a fœtid odour. After two or three days, the joint swells, and becomes very painful, and high fever sets in. In unfavourable cases, the animal dies from exhaustion, or at best, recovers with a permanently stiff joint.

The special liability of a joint to suffer irreparable injury from the formation of pus in it is due (1) to the difficulty of effectively draining the cavity; and (2) to the fact that, to work properly, the articular surfaces (p. 269) must be absolutely smooth and their lubricating apparatus in perfect order; failure in this mechanism being productive of disorganising changes and chronic lameness. The smallest opening which will admit air, or worse still, water or dirt, into the joint, may give rise to pus with its attendant

evil consequences. The health of a joint may, however, be retained even after the free admittance of air into it, if prompt and strict antiseptic precautions be adopted.

In the case of an open joint in which the inflammation runs an unchecked course, the articular cartilages and the ends of the bones which they cover, become ulcerated; the ligaments of the joint break down; abscesses form in the surrounding tissues; and the whole part becomes disorganised, with the result of a hopelessly stiff joint. There is always high fever, owing to the fact that some of the microbes in the pus formed in open joints, secrete products which act on the heat centres of the system.

THE PRINCIPLES OF TREATMENT OF OPEN JOINT are admirably summed up by Erichsen as follows:—"First, the synovial cavity must be thoroughly drained; secondly, the joint must be kept perfectly at rest, and firmly fixed; and thirdly, the discharges must be prevented from decomposing by some efficient system of antiseptic treatment."

TREATMENT.—If the injury be evidently superficial and there be no flow of synovia, the wound can be treated as an ordinary one. If, however, there be a discharge of synovia, it is safest to treat the case as one of open joint. In this case we should first of all try to make the part aseptic (not liable to putrefy), by removing all dirt and other extraneous matter, and by applying an antiseptic (p. 67), which we may do by syringing the wound a few times with a 5 to 10 per cent. solution of hydrogen peroxide in water; chinosol (5 grains to half a pint); or creolin or carbolic acid in water ($\frac{1}{4}$ oz. to $\frac{1}{2}$ pint). We may then protect it from the entrance of putrefactive germs by several layers of antiseptic wadding. If the wound is on or below the knee, it is well to apply cotton wadding (as in sprains, p. 45) over the antiseptic wadding, beginning at the foot and continuing the bandaging for a short distance above the wounded part. The object of checking movement in the case of a leg, would be promoted by placing a splint (Fig. 39) at the back of the limb; care being taken that the presence of the splint does not give rise to unequal pressure, which would be apt to interfere with the circulation of the part. Veterinary instrument makers supply special splints, the use of which would prevent movement in a fore leg, without the necessity of bandaging. This object may also be attained by applying a cantharides blister to the joints which we wish to make rigid for the time being. For instance, in the case of open knee joint from a fall, we might rub in a blister behind the knee and pastern; and about the elbow or hock, supposing that either of these joints was open. We should of course avoid allowing the blister to come in contact with the wound. Immobility should be further secured, if possible, by placing the animal in slings (p. 680). If any discharge soaks through the antiseptic wadding, the dressings should be removed, an antiseptic

applied, and fresh antiseptic coverings put on; because, even if a germ-free discharge be allowed to form a communication between the wound and the external air, or between the wound and a germ-tainted material like ordinary cotton wadding, microbes of putrefaction will quickly work through into the injured joint. If at first the flow of synovia be too copious to admit of its complete absorption by the antiseptic cotton wadding, I think it is best to dispense for the time being with this wadding, and to frequently syringe the wound with an antiseptic, so as to keep the part free from putre-

Fig. 39.—Splint devised by Mr. Pugh, M.R.C.V.S.

faction, and to promote drainage. If all goes well, the bandage can be left on for four or five days, and after it is removed, we can apply tannoform or other suitable antiseptic (p. 67) to the wound, and we should lose no time in again putting on the bandage, the evenly distributed pressure of which greatly promotes the process of healing, by keeping down the swelling that would otherwise ensue, and would more or less interfere with the circulation of the part. If putrefaction sets up in the joint, or if the pressure of

the bandage is unequally distributed, the part will probably become hot and swollen, in which case the bandage should be at once removed, and the wound rendered healthy in the manner already described. The bandage should not be re-applied, until the swelling has subsided. A slight swelling of the part would not warrant the removal of the bandage.

Maintaining a constant flow of cold water on the wound generally gives excellent results by closing the wound in a healthy manner without any other treatment, beyond keeping the part at rest. As soon as the discharge of synovia has ceased, the cold water treatment can be stopped and tannoform or iodoform applied.

A rough and ready way of treating an open joint, which has often a good effect, is to put over it a thick covering of quicklime.

Veterinary surgeons, as a rule, obtain excellent results in cases of open joints, by applying a smart biniodide of mercury ointment blister (1 to 8 of lard), after having rendered the part aseptic (p. 70) and dusting the orifice over with iodoform, boracic acid, or unslaked lime. The blister, besides keeping the part at rest, helps to close the orifice, and probably has an antiseptic action on the wound.

Broken Knees

is the term applied to any wound inflicted on a horse's knee or knees by falling, or by hitting himself.

In examining a horse to see if he has been "down," we should, in doubtful cases, closely view the knee in profile, so as to detect any roughness of the hair or swelling on the front of the joint, by which we may perceive that the horse has broken his knees on some former occasion; for unless the edges of a wound unite with a degree of accuracy we cannot expect to find after this accident, the hair will not lie smooth and level, and a severe blow will cause the part to be more or less "capped." The skin should be examined for the scars of former wounds.

The knee of the horse (Fig. 8, p. 35), which corresponds to the human wrist, is composed of two rows of bones, three in each row. These bones form three distinct joints, namely, one between the radius (bone of the fore arm) and the upper row; a second between the upper and lower row, which forms a third joint with the heads of the cannon and splint bones. There is most motion in the upper joint, and least in the lower one; hence in a case of broken knees, the injury usually is inflicted on the upper joint, seldom on the middle, and very rarely on the lower joint. Besides the six bones I have mentioned, there is a seventh one, the trapezium, placed at the back of the upper row of bones to serve as a lever-like attachment for the tendons of the muscles which bend the knee. Occasionally, we meet with an eighth and very small bone—the pisiform—at the back of the lower row.

In well-bred horses, the trapezium is often very prominent. This conformation, which is a desirable "point," may give the animal, to inexperienced eyes, a false appearance of being "tied in below the knee."

Over the front of the knee passes the broad, flat tendon of the muscle (extensor metacarpi magnus) which extends that joint. Between this tendon and the bones of the knee, in order to prevent friction, are placed two bursæ or sacs, which contain synovia (joint oil). As these bursæ partly overlap the tendon externally, they are liable to become wounded when the tendon is laid bare by the animal "coming down." On the outside front, if I may use the term, passes the tendon of the muscle which serves to extend the foot (extensor pedis, Fig. 7). There is also a small oblique extensor tendon which passes across the knee; and the skin, with its loose underlying tissue, finally covers the whole part.

The tendon of the extensor pedis, except in extremely grave cases, is, on account of its side position, hardly ever laid bare or injured.

Here, the principles which should guide our treatment, are those of "Wounds on or near Joints" (p. 91).

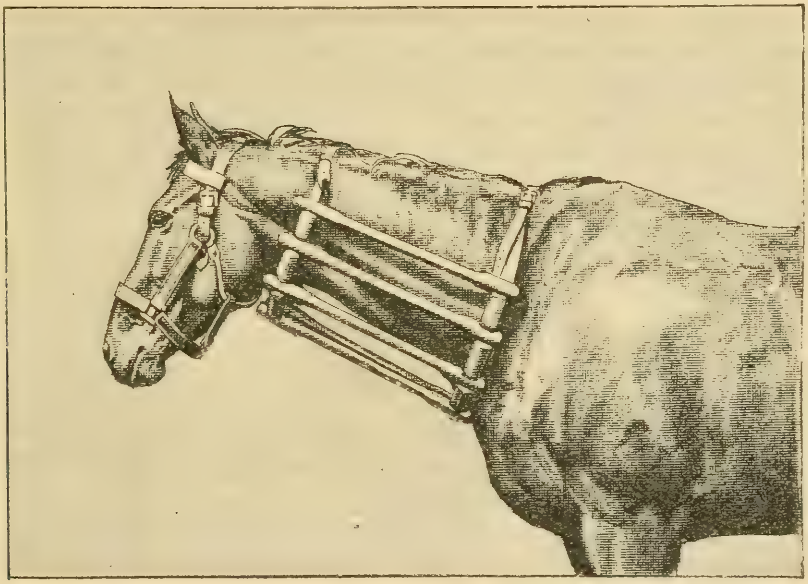


Fig. 40.—Cradle.

TREATMENT.—The object of our treatment should be to obtain repair with the least possible destruction of tissue, in order to limit the extent of the subsequent blemish as much as practicable, and to obviate the danger of the wound extending into the joint. Hence, strict antiseptic measures (p. 69) should be adopted. Poulticing or continued fomentations should on no account be employed; for they tend to destroy the vitality of the part, and to encourage suppuration, which is always accompanied by destruction of tissue. In all cases, we should by tying the horse up, or by using a cradle (Fig. 40), prevent him from injuring his bad knee. If dirt or grit has entered the wound, it may be removed by bathing the part with warm water for a few minutes; but if there is no foreign body in the cut, or if the skin is not divided, the application of water will serve no useful purpose. After cleaning the wound and dressing

it with tannoform, we may apply over it a thick covering of antiseptic wood wool or antiseptic cotton wool, and bandage with moderate pressure (p. 45). Here we should be most careful that the soft material is evenly distributed round the leg; that there is a sufficiency of it; and that the bandage, though it should give firm support, is not put on too tightly. Considering how difficult it is to keep dressings on the wound without interfering with the circulation, it is often the best plan to content ourselves with dusting the part freely over with tannoform and keeping it clean. At the same time we must remember that judiciously applied pressure is very valuable in getting the wound to heal in a healthy manner, and in preventing subsequent thickening of the part. If there be any discharge, we may gently syringe the wound two or three times a day with an antiseptic solution (p. 67), and renew the tannoform as may be required. If it be difficult to apply the tannoform, we may use a saturated solution of iodoform in eucalyptus oil. In case we cannot get any of these drugs, we can use burnt alum. If there be no discharge, it is best to let the wound heal in a dry condition.

"Very often a small piece of dead tissue will be seen presenting a deadened, white appearance in the wound. This should be removed by the curved scissors, otherwise it will act as a foreign body" (*Williams*).

If the animal has to be kept standing for a long time, slings should be employed. The horse should on no account get his freedom, until there is not the slightest probability of the skin cracking in the event of his bending the leg.

If the wound be sufficiently serious to warrant the fear of open joint occurring, especially if the animal is restless, he should be at once put into slings.

If the tendon has been crushed, and not cut, the crushed part may slough out after four or five days, and will leave the joint exposed. Whether this occurs by sloughing, or by laceration of the tendon, there is, then, great danger to the life of the patient. Even if he recovers, he will have a permanently stiff knee joint. If the injury be complicated by fracture of one or more bones of the knee, recovery may be regarded as nearly hopeless.

It is well to remember that the appearance of a flow of synovia, even in considerable quantities, from the wound in a case of broken knees, is no proof that the joint has been opened; for the synovia may be supplied from the synovial bursæ which are in front of the knee and which are not connected with the joint.

It sometimes happens that in a case of broken knees, the skin of the lower edge of the wound has been rumpled back by the horse sliding forward on his knees, when on the ground, at the time of

the accident, and a sac has been thus formed into which dirt has entered. In this case, the sac should be probed, and, at its lowest point, a horizontal orifice—so that the subsequent scar may be concealed by the hair—should be made with the knife, and a piece of narrow tape or a string of horse hairs (p. 76) passed through it, as a seton, to allow of dirt, etc., working out. Occasionally, this sac is not apparent for some days. It will then be found soft to the touch, and full of pus when it is opened—as it should be—at its lowest point. In such cases, the little finger may generally, with advantage, be substituted for the probe, which is an instrument that should be used with great caution about the knee, for both the tendons and joints of that part lie very close to the surface.

If the wound continues in a sluggish condition with but little discharge, we may, after dusting it over freely with tannoform, cover it with antiseptic cotton-wool, and then apply over it, with judiciously regulated pressure, a cotton wadding bandage in the manner described for sprains (p. 45), with the object of quickening the circulation of blood in the part. As a rule, the application of evenly distributed pressure will act far better in stimulating the part to healthy action, than the use of caustics.

Mr. Harold Leeney states, with reference to broken knees, that "A large experience of these cases leads me to think that the least blemish is obtained by picking off the scab every two or three days. I find that the divided edges are brought closer together, each time this is done. I have had a smaller blemish with old cab-horses, than was left on any of the preceding occasions they had been down."

If the injury be severe, a moderate dose of aloes may be given with advantage. In all cases, the food should at first be of a laxative nature. After the high bodily temperature caused by the injury has passed off, the animal's strength should be kept up by fairly liberal feeding.

Kerosene (paraffin) oil, or a mild blister, may be subsequently used to stimulate the growth of hair.

LEGAL ASPECT OF BROKEN KNEES.—This accident, after the wound has healed, is or is not an unsoundness according to the degree of injury inflicted. Although the slightest mark on the knee, as a rule, seriously detracts from the market value of a horse, the accident may not in any way injuriously affect his usefulness. In such a case, all requirements will be met by the fact of the blemish being mentioned in the certificate given by the veterinary surgeon. As regards the question of soundness, it does not matter a great deal how the horse got "marked;" for it is quite possible for an animal to fall down in the middle of a road from no fault of his own. If we had positive proof that the injury was caused by a fall

over which a normal horse would have had little or no control, we might regard it with less suspicion than we might otherwise do; for it is incontestable that a horse which has once been down, is generally more liable to stumble, than one whose knees have never come in contact with the hard road. Although it would be foolish to deny the fact that a blow inflicted on an important joint, like the knee, has a great tendency to be followed by weakness of the structures of the part; still, if after an exhaustive trial, we can detect no indication of the existence of such weakness, or of any other inability, it would be manifestly unfair to reject a horse because he had suffered from an injury which might have had, but which did not have an injurious result. Although a veterinary surgeon should be particularly careful about giving a certificate of soundness for a broken-kneed horse; he should not try to shield himself, at the expense of the owner, from the possibility of making a mistake. Practically speaking, only the slighter cases of "broken" or, rather, "chipped" knees, should be passed.

Wounds of the Mouth.

These injuries are generally inflicted by the bit, especially with recently broken-in animals; the chief seats of injury being the bars of the mouth (interdental space) and the corners of the mouth. The tongue may be torn by a man "hanging on" to it when giving a ball. I have seen many instances of the tongue, bars and chin-groove cut from the cruel application of a twitch over the lower jaw. The pressure of the mouth-piece of a curb bit (especially with long cheeks and a tight curb chain), and even of a snaffle (particularly if the snaffle be thin, twisted, made of chain, or if it be violently "sawn" through the mouth), often bruises and lacerates the bars. The action of a severe curb bit sometimes injures the bone of the lower jaw, and even fractures it. A sharp and tight curb chain not unfrequently wounds the chin-groove and lips. High ports have gone so much out of fashion, that nowadays we rarely see injuries inflicted by them on the roof of the mouth. The liability to become wounded by the port is naturally increased by the use of a tight noseband. I have seen the corners of the mouth rendered very sore from a watering bridle being kept on the horse for several days, and from the continued use of a wind sucking bit. I have known the mouth excoriated by contact with a bit which had become heated by the fierce rays of the sun in the tropics, and have seen in Russia a like injury occur by the use of a bit which had been rendered very cold by exposure to air of a low temperature during winter. Sharp, projecting edges of the back teeth are apt to wound the tongue.

Preventive measures, as far as bits are concerned, are fairly well indicated in the preceding paragraph. If the teeth be at fault we can set matters right by the tooth-rasp.

Rest and the frequent application of burnt alum or a saturated solution of boric acid, will generally be enough in mild cases. If pus forms, we should apply with a camel-hair brush a small quantity of an antiseptic (p. 67), such as a solution of chloride of zinc, 20 grains to the ounce of water, or turpentine, once every two days. All diseased portions of bone should be removed. With the object of obtaining a satisfactory cure, it is well to restrict the patient's food to green grass or other laxative herbage. The advisability of avoiding all causes of irritation, especially those which gave rise to the original injury, is self-evident.

Punctures from Thorns, etc.

These accidents are most common about the fetlock, knee, and forearm. When inflicted on the last-mentioned part, they are apt to give rise to serious consequences, owing to the tendency which the pus (matter) that forms, has to burrow down towards the knee by reason of the fibrous nature of the muscles of the forearm. If a thorn deeply penetrates the skin close to a joint, it is advisable, when it cannot be removed without cutting down upon it, to shave the hair and to blister the spot. The seriousness of the injury may generally be estimated, by observing the extent of the ensuing lameness. The blister, by preventing motion, will obviate the danger of the thorn working further in. It will also act as an antiseptic. If the puncture be near a joint, the blister will tend to prevent the entrance of air, and will thus lessen the risk of open joint; and, by softening the skin, it will help the thorn or other foreign body to work out. Poultices may be used when the puncture is at a distance from a joint. Much harm is often done by searching for thorns, etc., with the knife. Capped knee and capped fetlock are sometimes caused by thorns penetrating the synovial sacs of these joints.

Saddle Galls and Sore Backs.

Under this heading are included the ordinary injuries inflicted on a horse's body by the use of a saddle.

The construction of cross saddles and side saddles, which is a subject closely connected with sore backs, is described, respectively, in "Riding and Hunting," and "The Horsewoman" (2nd Edition).

VARIETIES.—The chief varieties of these injuries are those of the withers; of that portion of the back which is just behind the

cantle; of the off side of the back underneath the cantle; of the parts against which the points of the tree rest; of the general bearing surface of the saddle; and of the "girth place," which is the bottom part of the chest over which the girths pass. We may divide saddle and girth galls into bruises of the backbone and of the structures near it, and into ordinary bruises, cuts, or irritated patches of skin, or of skin and muscle. Bruises of the backbone and of its adjoining parts are always serious; as they are likely to develop into more or less troublesome abscesses. Although, under all ordinary circumstances, they are due to bad management, they may be the unavoidable results of legitimate work, as during military field service. In some cases of inflamed withers, the injury results in a synovial enlargement, to which I shall allude on page 332.

BEARING SURFACE OF THE SADDLE.—The only part of a horse's body which is fit to bear the weight of a saddle containing a rider, are the muscles which, on each side, cover the upper and more or less horizontal portion of the ribs between the loins and the upper end of the shoulder blade. These muscles rest on the upper portion of the ribs, which are connected underneath to the breast bone. As the vertebræ of the loins are unprovided with ribs, or with other firm support for these muscles, weight should not be placed by the saddle on the loins. As the spines of the back vertebræ (backbone) are incapable of supporting even a moderate amount of pressure without becoming inflamed, no part of the saddle or roller should bear on them. If the saddle be put so far forward as to press on the upper end of the shoulder blade, its presence in that position will more or less hamper the movements of the animal during the forward and backward play of that bone at each stride; even if it does not produce a wound or bruise.

WAYS IN WHICH THESE INJURIES OCCUR.—When the skin is unaccustomed to pressure, it will naturally be particularly liable to become bruised or cut from even moderate work. No matter how well inured to contact with saddle gear it may be, it can easily become inflamed by long-continued pressure interfering with the local circulation, as might occur with a very tightly girthed-up saddle during a long day's hunting. This undesirable result may also be brought about by the irritating effect of the panel or of the girths; or by the part becoming unduly heated.

The girths cause hurt, usually, by pressing upon a fold of skin, or by being kept too long in a tight condition.

As the use of a panel is, by its softness, to enable the back to bear with impunity the pressure of the hard tree of the saddle,

we must in all cases of saddle-injury on the upper part of the back, look upon the tree as the chief cause of hurt. Hence our attention, in the first place, should be directed to obtain a tree which will accurately fit the horse's back, and will thus afford the desired evenly distributed pressure. There is little or no good in trying to remedy faults in the shape of the tree by stuffing, the employment of which, except in inordinate quantities, can only mitigate, not wholly obviate, undue local pressure.

The modern custom of using felt panels, instead of panels stuffed with flock or curled horse hair, is not an uncommon cause of sore back, on account of the comparative hardness of the felt. Felt panels being less bulky than the other kind, enable a rider to get closer to his horse, and saddles fitted with them can be used with impunity for short periods, as at polo and steeplechasing, but they are not applicable, as a rule, to hunting, especially if the rider is a heavy weight. Felt is too hard for the panels of side saddles.

The withers become galled, generally, as follows:—(1) By the downward pressure of the gullet plate; (2) by lateral pressure on both sides, when the arch of the gullet plate is too narrow, or when it has become blocked up by, for instance, too thick a *numdah* (felt saddle-cloth); or (3) by too much weight being put on the near side of a side-saddle, which disturbance of balance is inseparable from the practice of rising in the trot, and is also caused by the lady using too long a stirrup and sitting too much on the near side, in all of which cases, the injury—supposing that the arch of the gullet plate is sufficiently high not to press on the top of the withers—will be inflicted on the off side of the withers. In order to diminish the drag to the near side, which is only too common among users of side-saddles, the distance apart of the points of the tree of a side-saddle should accurately correspond to the thickness of the body of the horse at that part, so as to diminish as much as possible this objectionable near-side drag. It is evident that the greater the distance between the tree and the horse's back, whether caused by too much stuffing in the panel or by the use of too thick a numdah, and the slacker the girths; the less resistance will the saddle offer to a lateral pull. We ought therefore bear in mind that the amount of stuffing in a panel should be strictly limited to its purpose of interposing a soft cushion between the hard tree and the tender back, and that a side-saddle should be girthed up tighter than a cross-saddle. Not unfrequently with horses ridden by ladies, the off side of the back, just under the cantle, as well as the withers, gets rubbed on account of there being too much stuffing in the panel, and because the girths are too loose. The good effect of the balance strap, particularly in preventing lateral play, should be fully utilised. We cannot get

over the fact that however "square" a lady's seat may be, it is impossible for her to avoid, at all times, putting more weight on the near side than on the off; hence the great necessity of having her saddle accurately fitted.

In a side-saddle, the nearer the leaping head is to the near head (upper crutch), the less near-side drag will there be, especially at a trot.

Pressure from imperfectly-stuffed rollers is not an unfrequent cause of sore withers.

The use of too short a saddle occasionally gives rise to a sore back, just behind the cantle, upon which spot an undue proportion of the weight is in such cases liable to be thrown. With a saddle of this kind, if the horse be made to go fast or to jump, the skin immediately behind the cantle being pressed downwards and backwards, will become wrinkled at each stride the animal takes; the result being that inflammation is set up, and a tumour appears. A repetition or two of this process increases the evil; pus is formed; and the horse may be laid up for a month or more with an abscess which usually turns into either a sac of soft matter, or an unhealthy sore with a hard margin of skin round it (a "sit-fast"). I have seen so many cases of these injuries having been produced by the saddles in question, even after they had been stuffed and restuffed, that I am confident I am right in laying the blame on the shortness of the tree, in the majority of cases of saddle galls behind the cantle. We should bear in mind that the correct length of the tree depends principally on the length of the thigh of the horseman The tendency to such an injury is naturally increased by the unworkmanlike practice some riders affect of sitting far back in the saddle, and of sticking their toes out in front of the horse's shoulders; the consequence being that the weight is thrown on the cantle at each stride, instead of on the centre of the saddle. Inferior saddlers often allow the head of the nail which attaches the panel to the tree under the cantle, to project, so that the horse upon which the saddle is put, can hardly escape becoming hurt.

Want of condition is a strong predisposing cause of saddle and harness galls.

After a case of sore back, a horse will often flinch for months, or even years, if the part be suddenly touched. If the flinching be simply due to the remembrance of former pain, the animal will allow the part to be handled, if the operator begins by gently rubbing the skin some distance away from it, and then gradually works up to it. From this cause, a horse often contracts the habit of crouching down when being mounted, and for a short time after the rider is in the saddle. Memory is certainly one of the strongest faculties in the mind of a horse.

PREVENTIVE MEASURES.—We should use only well-fitting saddles of suitable shape and size; should avoid the adoption of a seat which is likely to cause saddle galls, and should attend to the stuffing and lining of the saddle, and to the fit of the numdah, if one be employed. The best kind of panel (see "Riding and Hunting") for a saddle which has to be used for long work, such as hunting, is one of good flock and covered with serge; supposing that there is a competent saddler to whom the saddle can be sent, say, once a year, to be overhauled. As the panel is apt to get hard and "lumpy" from the absorption of perspiration; it should be dried, beaten and brushed as may be required. A saddle-cloth will act as a useful protection; and, if it is of felt or cloth, it will soak up the perspiration. Leather saddle cloths, which should be a little larger than the panel, are useful as a rule in preventing sore backs; but care should be taken that they are kept soft by having fat or oil rubbed into their rough side, which is more porous than their smooth side, which is next the horse. In most cases, felt acts better than leather for the purpose under consideration, on account of the readiness with which it absorbs perspiration. It goes almost without saying that young horses put into work for the first time, or animals which have had a long spell of idleness, are, when ridden or driven, much more liable to become galled, than those which are in regular exercise. A "heated" state of the system naturally predisposes a horse's skin to become inflamed.

When saddle cloths or numdahs are used, the groom, before girthing up the horse, should, with his finger or thumb (Fig. 41), raise the cloth well up into the arch of the gullet plate, so that it may not press tightly down on the withers. At the same time, care must be taken that the numdah is not so thick as to fill up the gullet plate, and thus pinch the withers at each side. Useful as numdahs undoubtedly are for preventing a badly fitting saddle from hurting the horse, or for saving the panel from becoming wet with perspiration; their presence naturally increases the liability of the saddle to shift.

I have seen horses galled by the pressure of the points of the tree, which in such cases were too close together for the horses on whom the saddles were used.

The employment of pads or pieces of felt (sewn on to the panel, or loose) to relieve local pressure, is generally ineffective if the animal has to be ridden for a considerable time, as out hunting; because the failure to fit, lies in the tree and not in the panel, and because such appliances can rarely be put on sufficiently evenly to properly distribute the pressure. They may, however, answer well during a short ride, as at polo, or during a race or steeplechase. A

pad for the withers may be made as follows:—Take six or eight pieces of felt, each being about four inches broad and six or seven inches long. Arrange them so as to form two pads of equal thickness, about four inches apart, on a piece of cricketing flannel thirteen or fourteen inches broad and seven or eight inches long. Place over the whole a similar piece of flannel, and sew them together so as to form one pad, the centre and thin part of which will lie over the withers, while the padded sides will raise up the pommel. A folded handkerchief or towel placed on the withers is of little benefit, for, as a rule, it will simply prevent them being cut by the iron gullet plate, but will not relieve them from pressure.

If a numdah be used, it should consist of one entire piece of felt, and should not have a longitudinal strip cut out of its centre, as is sometimes done; for the edges of this opening can hardly fail, during a long ride, to injuriously affect the distribution of weight, with the result of a more or less sore back.

Riders should remember that during a long ride, as out hunting, relief to the horse's back by occasionally dismounting will greatly lessen the chances of saddle galls occurring. On similar occasions it is well to see to the girths of a lady's saddle and to tighten them if necessary, after the rider has been on it, say, for half an hour, with the object of preventing the saddle from shifting by reason of the girths becoming slack. When a lady dismounts for some time, and when it is not convenient to remove the saddle from her horse's back, we might with advantage slacken the girths, even for a few minutes, so as to obviate any ill effects which might accrue from impeded circulation of blood.

If that part of the back on which the saddle has rested, be thoroughly and quickly dried by brisk friction, preferably with the hand, on returning from work, no harm will result from the gear being removed while the animal is still warm. But if the rubbing down be neglected, the result may be a tumour which might develop into an abscess.

If it be not convenient to groom without delay a horse which returns hot from a ride, the girths should be loosened, the saddle raised off the back, instantly replaced, and then kept on for at least twenty minutes, during which time it would be all the better for the horse to be walked about.

The girths often cut a horse, from the groom having neglected, when girthing up, to pass a finger or two of each hand (Fig. 42), and draw them from above downwards between the girths and the skin, so as to smooth out any wrinkles. Girths of raw hide or of cord which allow of ventilation, are often useful for avoiding galls. The girth which I have found to be least liable to gall a horse, is one of broad webbing attached to two buckles on each side, with or without

the narrow girth which is characteristic of the Fitzwilliam pattern. A broad leather girth kept soft by the frequent application of grease or oil, often serves to prevent girth galls. If the skin is very tender, a piece of lambskin may with advantage be sewn round the girth, with the wool towards the sensitive part.

TREATMENT.—The appropriate treatment of these injuries can be considered under the following headings:—

1. Bruises which may develop into abscesses, and which at first are neither inflamed bursæ nor serous cysts. We find these injuries generally on the withers, on the backbone just behind the cantle, on the off side of the back underneath the cantle (with side-

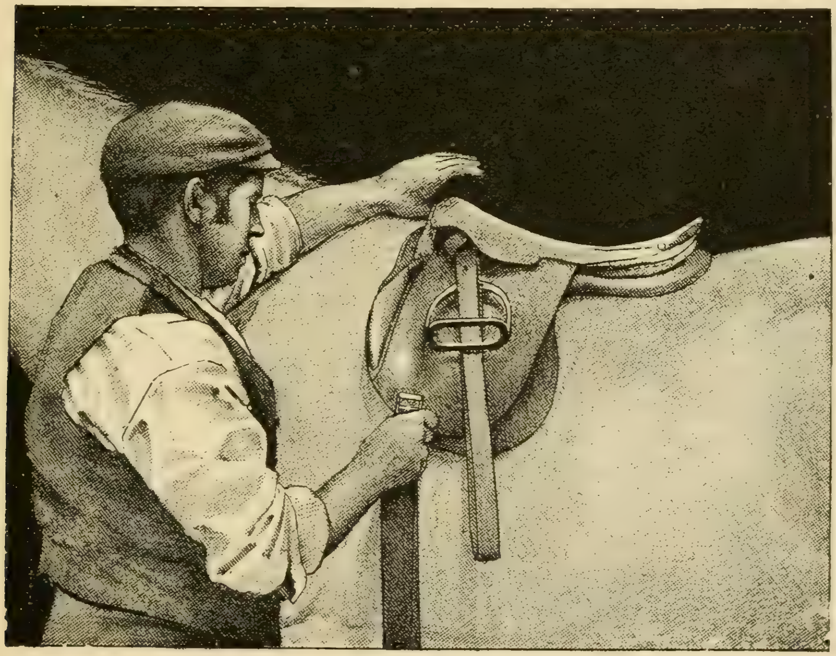


Fig. 41.—Raising saddle cloth off the withers before girthing up.

saddles), and at the "girth place." If such a hurt has been inflicted, it will in almost all cases be made evident, on removing the saddle, by the swollen condition of the seat of injury. In this case, the swelling is due to passive congestion (p. 14) brought on by pressure, and consequently may be appropriately treated by hand-rubbing (p. 664). We may do this, if the skin is not broken, by pouring into the hollow of the hand spirits of wine, methylated spirits, whisky, or brandy, and rubbing it into the part with gentle friction, which may be continued for about ten minutes. This application of friction is so efficacious in relieving congestion, that

I have often seen a swelling of this kind perceptibly diminish in size after it had been thus rubbed for a few minutes. For this purpose, eucalyptus oil is more effective than spirits; but is liable to irritate the skin. Hence we should restrict its use to those cases in which we fear that the swelling may develop into an abscess (p. 77). If there be a wound as well as swelling, we may apply to the part, ice, which, after breaking it into small pieces, we may enclose in an indiarubber bag made for the purpose, or in other waterproof material, or we may place over it a single fold of cotton rag, which we should keep constantly wet with cold water. If the swelling does not go down in a day or two, and we have reason to suspect that pus is likely to form, we may rub over it eucalyptus oil from time to time, or oil of turpentine, which will slightly blister it. If our attention has not been called to the injury until pus has begun to form, we may rub on the part biniodide of mercury ointment and open it with the knife (Symes' abscess knife, for choice), when the tumour has become soft to the touch, and when the inflammation has subsided. It is well to open the abscess as soon as we are certain that pus is present, which fact we may assume if the tumour becomes soft and "pits," and if the previous abnormal heat has left it. Having made the opening, we should syringe out the pus, and treat the part as directed on page 79. After the cavity has been thoroughly cleaned out, I have found that an injection of a solution in ether of as much iodoform as it will take up, acts well in these cases. A blister may be applied around an open abscess in order to stimulate it to healthy action. If we cannot obtain efficient drainage, we may pass a seton, smeared over with biniodide of mercury ointment, through the lowest part of the abscess. If the vertebræ have become involved, they should be cut down upon, and the dead or diseased portions removed. Abscess of the withers is usually called "fistulous withers."

While the animal is idle, it is well to keep him on green food. If his withers are sore, care should be taken that he does not rub them against the frame-work of his stall or loose box.

When open abscesses on the back are subjected to the continued pressure of the saddle, they are liable to take on an angry, unhealthy-looking appearance, and to acquire a hard, leathery margin, in which case, as I have already said, they are sometimes called sitfasts. As the hard, dead skin which surrounds the sore, acts as a foreign body; it should be removed. This can be best done with the knife after having cast the horse, and after having rendered the part insensitive to pain by means of cocaine (p 608). The resulting wound should be treated antiseptically (p. 67, *et seq.*). If a piece of skin, as sometimes happens, is found in the centre of the wound and detached from the remainder

of the skin, it should be torn off, or cut out; for if this be not done, it will act as a foreign body and will keep the wound open. When a small piece of skin becomes isolated, it is apt to lose its vitality; probably on account of its having been deprived of blood supply from the surrounding skin, as we may see when cross lines are deeply burned into the skin during the operation of firing, so as to form diamond-shaped marks.

2. An inflamed condition of the bursa which lies on the summits of the bones that form the top of the withers (p. 332).

3. A serous cyst which may occur on one or both sides of the withers (p. 337).

4. Fibrous tumours, which usually form on the withers or over

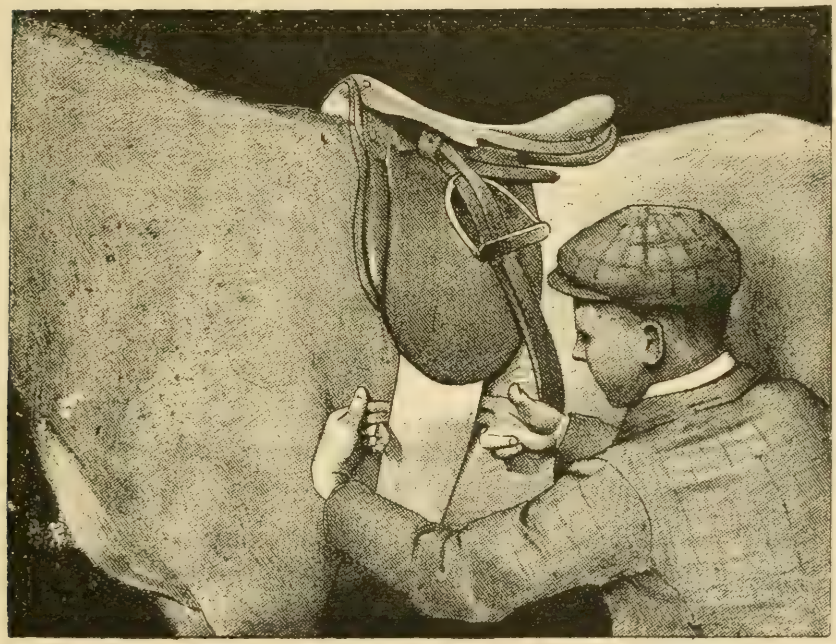


Fig. 42.—Smoothing out wrinkles under the girths.

the backbone, just behind the cantle of the saddle. These tumours should be carefully dissected out with the knife, and the resulting wound treated antiseptically (p. 67 *et seq.*).

5. Cuts or chaps without sufficient bruising to cause an abscess. We may apply to them a couple of times a day tannoform, iodoform, Friar's balsam, or alum and water.

Whenever a scab becomes bruised or hurt, it should be bathed with warm water or poulticed, so that it can be easily removed, after which any new matter that may form, will have free vent. The wound should then be treated with an antiseptic (p. 67).

6. "Heat-spots" from irritation caused by contact with the saddle

gear, and assisted by heat and perspiration. As treatment, we may wash the part with warm water and tar soap, Jeyes' soap, or strong carbolic acid soap, and then apply oxide of zinc ointment, salicylic acid ointment (1 to 8 of lard), or a mixture of 1 part liquor plumbi subacetatis and four parts sweet oil, glycerine, or cream.

As long as the horse's back continues sore, he should not be worked.

Harness Galls.

The harness saddle (or pad) is liable to injure the withers in the same way as a man's saddle, in which case the treatment will be alike for both forms of hurt. The shoulders, breast, and neck may be galled by the collar, or breast harness; and the sides, by the traces.

The best preventive measures are: Accurate adjustment of the gear; suitable stuffing; gradually accustoming the animal to the work; and dressing the parts of the shoulders and neck which have borne pressure, with a saturated solution of alum in water, directly the collar has been removed after work. The frequent application of a strong solution of alum and water, or even of salt and water, will serve to harden the skin.

Treat as for saddle galls (see preceding section).

Poll Evil.

DEFINITION.—Poll evil is an inflamed condition which tends to the formation of deep-seated abscesses, and which is found, as a result of injury, on the top of the neck immediately behind the ears.

CAUSE.—I am inclined to think that the sole cause of poll evil is injury, which, in this case, is usually incurred by the horse hitting himself when pasing through low doorways, or low passages, or by being struck. Percivall states that it is often brought on by the cart-horse rubbing his poll against any convenient object, when suffering from irritation due to the wearing of hard, heavy, and ill-fitting head-collars. The parasites (*discomyses equi*, see page 121) which are often found in scirrhous cord, are said to sometimes gain entrance into the wound of poll evil. With this complication, iodide of potassium should be given as directed on page 127.

NATURE.—Poll evil, according to Möller, begins as an inflammation of the synovial bursa which lies on the top of the second neck vertebra (the axis) and which consequently enables the suspensory ligament of the head and neck that extends from the top of the head to the withers, to freely play over the bony prominence covered by it.

SYMPTOMS.—At first the swelling is about the size of a mole; hence the German name, *Maulwurfsgeschwulst* (mole-swelling). It

is soft and gives the feeling of being full of fluid, and is more or less hot and painful. In the event of successful treatment, all inflammatory symptoms may subside. If the diseased process continues, the swelling becomes hard and diffuse. Owing to the pain which movement of the part causes, the sufferer carries his head stiffly. Abscesses form, break out on the surface of the skin, and burrow deeply down so as to involve bone and muscle. Death may occur from exhaustion and from pus gaining entrance into the spinal canal.

TREATMENT.—Treat as for abscess (p. 79). A seton will generally act well. Feed from a raised manger and not from the ground. A horse with poll evil should not be turned out to grass; for retaining the head for a long time in a low position would seriously interfere with the animal's chances of recovery.

Burns and Scalds.

VARIETIES OF BURNS.—Cadiot and Almy divide these injuries as follows: *Burns of the first degree*, in which only hair has been consumed and a slight inflammation of the skin set up. *Burns of the second degree*, in which blisters and pustules have been produced. *Burns of the third degree*, in which the skin has become charred, with or without grave results.

TREATMENT.—A burn or scald injures by nervous shock, and by producing a wound, which we should treat antiseptically (p. 67), so that it may heal up with the formation of as little pus as possible. If blisters appear, draw off the fluid by introducing a needle under the skin about half an inch beyond the margin of the lowest point of the blister, so that the fluid (serum) may be pressed out through the passage made by the needle, without air being permitted to enter the sac. This is done in order to retain the cuticle of the injured part, as a protection to it. To render the needle free from germs, it may, before using it, be kept in boiling water for about five minutes, and then allowed to cool. If the skin be merely reddened or blistered, we may apply iodoform ointment, zinc ointment, glycerine, sweet oil, castor oil, or carron oil, and keep it covered over with antiseptic cotton wool for a few days. If the skin be injured, with or without implication of the underlying tissues, we should treat the injury antiseptically as an ordinary wound which we hope will heal with as little suppuration as possible. We may therefore apply tannoform, iodoform, or oxide of zinc freely over the part, and cover it over with antiseptic cotton wool or lint or ordinary cotton wool smeared over with iodoform

ointment or salicylic acid ointment, or soaked in eucalyptus oil. If nothing else is at hand, we may dust the part over with a thick layer of wheaten flour or powdered starch, the good effect of which will be much improved by the addition of a fourth part of finely powdered boracic acid. The after treatment does not differ from that of a wound. Iodoform should not be used over large surfaces, for in that case it might act as a poison. A saturated watery solution of picric acid applied by means of lint soaked in it and left in position for two or three days, if there is no rise of temperature (Whitla's "Dictionary of Treatment"), acts well in mild burns of small area, but, as Dr. Carless ("The Year-Book of Treatment," for 1899) has pointed out, its application has many drawbacks.

If the pain be great, give 1 oz. chloral hydrate in a pint of water, as a drench, and keep up the strength by a quart of beer, or a couple of glasses of spirits mixed with water, every now and then. A severe burn or scald causes great shock to the system; hence the necessity for supporting the vital power after these accidents.

Wounds of the Abdomen

in their severe forms, are generally caused by "staking," as when a horse, in jumping "short," impales himself on a spiked railing or on a sharp pointed stake; and by thrusts with stable forks, horns of cattle, weapons of various kinds, and other pointed objects, as in carriage accidents, etc. Their gravity chiefly depends: (1) on the introduction into the abdominal cavity (the space which exists between the sides of the abdomen, and the abdominal organs, such as the bowels, stomach, liver, spleen, etc.) of contaminated matter from the wounded bowel or from outside; (2) on an irreducible protrusion of a portion of the contents of the abdomen; and (3) on injury to the internal organs. In considering the chances of recovery, we must remember that horses often survive very severe penetrating wounds of the abdomen, with or without treatment. Wounds of the abdomen may consist of simple injury to the skin and superficial muscles; or of an opening into the abdominal cavity, with or without injury to the internal organs; and with or without protrusion of one or more of the internal organs through such opening. In an accident of this kind, the great danger is the setting-up of peritonitis (p. 114), namely, inflammation of the peritoneum (the membrane which lines the abdomen and covers the bowels and other organs) by the escape into it of a portion of the contents of the alimentary canal, or of blood, or by the introduction into it of foreign matter from without. Injuries which come under the first heading, may be treated as simple wounds, in which case, precautions should be taken to prevent matter (pus) working down through the under-

lying structures, and to allow it free exit. In ascertaining the depth of the wound we should use the finger rather than the probe, lest by our interference we might convert a superficial wound into one penetrating the abdomen. In the graver cases, a large dose of extract of Indian hemp, say, 4 drachms, or 1 oz. of chloral hydrate may be given to relieve the pain. In order to nullify the action of putrefactive germs (p. 63), a solution of 1 part of creolin or carbolic acid to 40 of water, or one of 15 grains of chinosol to a pint of water, may be freely applied to the part, and introduced into the wound by means of a sponge and stick, or other suitable arrangement. Any one of these applications may be used on an exposed part of the bowel without fear of ill consequences. Ready escape for matter should be provided, the knife being used if necessary. Although the employment of stitches to a wounded bowel is not very likely to give good results in horse practice, I may point out that, to be effective, they should not be further apart than a twelfth of an inch; that the turned-in serous (outer) surfaces should be brought together by the sutures; and that fine carbolised silk thread may be used. If any internal organ protrudes, it should be carefully washed with the antiseptic solution, and an attempt made to return it, except in the case of omentum (p. 284), which has become injured. Such protruding portion of omentum may be safely cut off. The wound should finally be disinfected by the antiseptic lotion, and closed with stitches; due precaution as to drainage being taken. The abdomen may be bound round with a sheet. In order to keep up the strength, while giving the bowels the least possible amount of work to do, food in a concentrated form should be given, such as skimmed milk with the yolks of hard-boiled eggs mashed up in it, oatmeal gruel, etc. Boiled barley and a linseed mash, now and then, may also be of use. If constipation ensues, a little linseed oil, say, a quarter of a pint, may be mixed through the food three times a day. As peritonitis (p. 114) is an extremely fatal disease, our efforts should be directed to prevent its occurrence, and, if it sets in, to mitigate its effects. We should also take proper precautions to prevent pus from burrowing down and forming abscesses.

Wounds of the Chest

result from the same causes as those of the abdomen (p. 110), with the addition of wounds, by broken ribs, of the lungs and of the membrane which covers them and lines the chest. The only wounds we need consider here are those which penetrate the wall of the chest, or injure its contents, as the end of a broken rib might do; for wounds of the exterior of the chest wall require no special treatment beyond the observance of precautions against their dan-

gerous, if not fatal, extension into the chest. Wounds which penetrate into this cavity are so grave (in human practice the mortality is about 80 per cent.), and admit of such a slight employment of remedial measures, that I have little to say about them from a practical point of view. Any splinters, dirt, or other foreign bodies which may be in the wound should be removed and the wound freely washed with an antiseptic lotion (p. 67), of which the best, in this case, is probably peroxide of hydrogen. In our endeavour to keep the wound free from contamination, we should not touch it with either probe or finger before thoroughly disinfecting (p. 70) our exploring instrument. We may then freely dust tannoform over the wound, cover it with five or six layers of antiseptic cotton wool (p. 608), and apply a bandage to keep the dressing in place, unless there be continued bleeding, in which case the wound should be left more or less open, and should be kept clean by being bathed or gently syringed over with an antiseptic solution. As a rule, slings should be employed, and the patient kept on gruel, mashes, green food, and carrots, with plenty of fresh water to drink. No local treatment will be practicable for internal injuries of the chest unaccompanied by an external wound.

COMPLICATIONS.—The following are the chief complications resulting from these wounds:—

(1.) *Bleeding.* A frothy discharge of blood from the nose, in greater or less quantity, is a usual though not invariable symptom of the lung being wounded. The blood, instead of issuing from the wound, may be discharged into the cavity (the pleural sac) between the lung and the wall of the chest, thus constituting the condition known as *hæmothorax*, which cannot fail to take place in the event of the surface of the lung or the inside of the wall of the chest being wounded, when there is no external outlet for the fluid. The symptoms of this internal bleeding, besides the frothy discharge of blood from the nostrils, will be paleness of the mucous membranes, weakness of pulse and depression of the vital forces from loss of blood, and more or less difficulty of breathing from the pressure of the blood in the pleural sac on the lung, which will suffer collapse proportionate in amount to that of the escaped fluid. The presence of this blood in the pleural sac is very dangerous, especially in conjunction with an external wound; for the escaped blood is apt to putrefy or at least to form adhesions between the wall of the chest and the lung.

(2.) *Emphysema* or accumulation of air in the loose connective tissue is found underneath the skin, between the muscles and other structures near the surface of the body. This is generally first

noticed near the wound, but may extend, more or less, over the body, which will have a blown-out appearance. As a rule it occurs by air, during inspiration, entering the pleural sac either through an external wound or a wound in the lung; and, failing to obtain exit by means of its way of entrance, being squeezed by the elastic recoil of the ribs during expiration, into the loose connective tissue which lies open on the wounded surface of the chest wall. In cases of emphysema, the return of the air is prevented by the valve-like action of the wound, or wounds. Emphysema requires little or no special treatment, as it is seldom hurtful. If, as might happen in very rare cases, it interferes with the breathing, we may let out the air through the skin, at convenient spots, with the knife, or trocar and cannula.

(3.) *Pneumothorax* or accumulation of air in the pleural sac either from an external opening or from a wound in the lung. This condition is brought on in the same manner as emphysema, and it is dangerous, owing to its liability to cause "collapse of the lung." As the act of inspiration is that of enlargement of the cavity of the chest, which in health reduces the air pressure in the lung and thus causes the lung to become inflated by the in-coming air; the presence of air in the pleural sac will, by the resulting pressure on the surface of the lung, directly oppose the performance of this function, and will accordingly give rise to more or less difficulty of breathing. To relieve this serious condition, we may enlarge the external wound, if there be one; or tap the distended pleural sac with a trocar and cannula, which is an operation that demands an accurate knowledge of the anatomy of the part. "The chest may be largely opened and yet no collapse take place. This seems most probably to be due to the adhesion of the two smooth moist pleural surfaces to each other" (*Erichsen*). When a fair-sized external opening communicates with a wound in the lung, air will rush in through the external opening during inspiration, and be more or less expelled out through it during expiration.

(4) *Pleurisy* and (5) *pneumonia* will respectively follow wounds of the pleura and lung. We can do little to relieve these complications beyond carefully nursing the patient.

(6.) *Empyema*, or pus in the pleural sac, is a very serious condition which is usually brought on by contamination of blood or of inflammatory discharges which have accumulated in the pleural sac, or by the entrance into it of dirt and other germ-laden material. Treatment should consist of a thorough disinfection of the part by an antiseptic solution (p. 67) and effective drainage, by if necessary, enlarging the external wound, and by making a counter-opening "on a probe passed from the original wound and made to project between two ribs, as the relations of

the walls and contents of the cavity are often much altered in these cases, and unless a guide is obtained in this way, either the diaphragm or the lung might be accidentally wounded. Large drainage tubes should be inserted at the wound and the counter-opening if one has been made" (*Erichsen*). As the treatment of a case of empyema is similar to that of an abscess (p. 77), we may syringe out the pleural sac with a solution of hydrogen peroxide in water (1 to 10) if necessary.

Bleeding after Castration.

Owing to weakness of the walls of the blood-vessels, unusual size of the artery, unskilful manipulation, or other causes; serious bleeding may occur after castration. It may be stopped by getting hold of the end of the severed cord, and ligaturing the artery, or again dividing the cord, higher up, with the écraseur. The treatment for the arrest of bleeding, recommended on pages 71 and 72, should be adopted here. Some practitioners recommend that an enema or two of water, as cold as possible, should be given; and others, that a lump of ice should be placed within the scrotum. Fleming advises the application of a folded horse-rug, saturated with cold water, across the loins for a few minutes. I have found the best results to be obtained by casting the animal, putting him on his back, removing the blood from the cavity in the scrotum with a sponge, securing the bleeding ends of the arteries with an artery torsion forceps, and twisting them, or even by seizing the cut ends of the arteries with the fingers, and keeping them firmly compressed for a few minutes, after which I have generally found the bleeding to have ceased.

Peritonitis

is inflammation of the peritoneum, which is the smooth and glistening membrane that lines the walls of the abdomen and covers the stomach, liver, spleen, intestines, and other abdominal organs. It descends, at each side, through the inguinal canal, lines the scrotum and covers the testicles. The peritoneum thus forms a closed cavity or sac.

NATURE.—As the peritoneum is a serous membrane, inflammation in it is followed by a more or less copious secretion of watery fluid (serum), with the usual symptoms of redness, suppuration, and the formation of adhesions. The liability to and danger of peritonitis is directly proportionate to the contamination of the part. "The experience of the operation of ovariotomy shows us that the peritoneal cavity may be opened and freely exposed to the air without any great risk of the occurrence of septic peritonitis, provided that it be thoroughly cleaned and no decomposable matter be left within it. The subject has furthrr been experimentally investigated in animals by Wegner, and the results obtained by him tend to show that, if only a portion

of the peritoneum be exposed to irritation, the liquid exudation is rapidly absorbed by the healthy part of the membrane, so that the cavity is kept dry and free from putrescible matter. In rabbits it was found that a considerable quantity of simple water, or even of fluids containing septic bacteria, could be injected into the peritoneal cavity without evil results following, the fluids being rapidly absorbed and carried into the blood-stream. If, however, the quantity injected was greater than could be thus rapidly disposed of, septic peritonitis invariably followed" (*Erichsen*). The entrance, into the abdominal cavity, of dung from a wounded bowel, dirt, or blood is extremely liable to give rise to fatal peritonitis. The most obvious lesson to be gained from the foregoing observations is the necessity of the employment of the strictest possible antiseptic precautions (p. 70) in all operations (such as castration) by which the peritoneum is necessarily wounded, and in the treatment of all injuries by which the peritoneum has been hurt.

VARIETIES.—Peritonitis may be circumscribed (confined to one spot) or diffuse (affecting more or less the entire surface); acute or chronic; primitive (appearing independently of any other disease), or secondary to an injury or other affection. In horses, it is almost always acute and secondary.

CAUSES.—The usual cause is injury to the peritoneum, as in castration, penetration of the abdomen, hernia, and foaling. Trasbot states that the drinking of excessive amounts of cold water or the eating of inordinate quantities of snow or ice may bring it on.

SYMPTOMS.—Frequent and wiry pulse (showing high arterial pressure); hurried breathing; rigidity and distension of the abdomen, which is very painful to the touch; arching of the back and tucking up of the belly; great depression and distress; disinclination to move; frequent and painful attempts at making urine, which is voided in small quantities; and coldness of the ears and legs. Up to the last, the lungs seem to act well; but the heart appears unable to supply them with blood. Towards the end, the pulse becomes imperceptible. In fatally acute cases, the animal dies after a few hours' suffering.

CHANCES OF RECOVERY.—As a rule, an attack of peritonitis in the horse is followed by death.

TREATMENT.—We may try the effect of $\frac{3}{4}$ oz. of Indian hemp in a ball, or $1\frac{1}{2}$ oz. of chloral hydrate in a pint of water, and apply warm fomentations to the part. We might bleed.

Stroke of Lightning.

Horses which are out in the field are sometimes struck with lightning. There have been a few cases of horses being more or less injured by discharges from electric wires. The shock may cause instantaneous death; or more or less unconsciousness, and

paralysis. Besides the nervous effect, the electricity may burn the hair, skin, and underlying structures; may tear the soft parts; and even break bones. The burns on the hair and skin not unfrequently take the form of tracings of the branches of trees.

To relieve the unconsciousness, we may cause the patient to smell ammonia, and give him strong tea or coffee to drink. We may combat the paralysis by rubbing into the part some stimulating liniment, such as compound camphor liniment; a mixture of one part of either turpentine or kerosene (paraffin) oil to two parts of any ordinary oil; or mustard oil. To stimulate the paralysed muscles, we may inject subcutaneously in their neighbourhood, from time to time, two grains of the hydrochlorate of strychnine dissolved in a teaspoonful of water. Or we may give a drachm of nux vomica in the food.

Frost-Bite.

The effects of frost-bite in the horse are usually confined to the frog of the foot (giving rise to thrush) and to the skin of the pastern. The practice of using salt to melt snow is liable to cause frost-bite in the feet of horses which travel on roads thus treated.

In Russia I have seen several cases of the tips of horses' ears having been removed by frost-bite.

The symptoms of frost-bite are due to the fact that if the blood is driven out of any part, and that part is kept bloodless for a period which need not exceed two or three minutes, inflammation will be set up if the blood be allowed to again enter the vessels, especially in large quantities. If the blood-vessels continue to be deprived of blood for a comparatively long period, they will become incapable of receiving the blood, and the part will consequently remain bloodless and dead. In this case, suppuration will be set up in the neighbouring healthy tissue, and the dead part will become separated. In cases which admit of recovery, the inflammation caused by the re-entrance of the blood will not be sufficiently intense to cause destruction of the part. To obtain this desirable result, the re-admission of the blood should be very carefully regulated; for the larger the amount, the greater will be the irritation to the vessels. Hence, the worst possible treatment we could apply to the part, would be to immerse it in warm water, or to expose it to the influence of a fire. On the contrary, our efforts in stimulating the return of the blood should be limited to friction with a lump of snow, or with a pad of cloth or straw dipped in cold water. As the horse cannot give us an account of his feelings, and as his skin is thick, covered with hair, and generally full of pigment; we are hardly ever able to apply remedies for frost-bite to him in sufficient time to aid in the restoration of the part to

health. Our interference will therefore be limited, as a rule, to treating the part antiseptically (p. 67) as an ordinary wound. Tannoform or iodoform may be freely dusted over the part, which may be stimulated, if necessary, by the application of a little turpentine or phenicated camphor (p. 69).

Inflammation of Veins *(Phlebitis).*

The only form of inflammation of veins I shall here consider, is that to which the jugular vein is liable from the operation of bleeding.

CAUSES.—The chief causes which induce inflammation in that portion of the jugular vein which has been wounded during bleeding (p. 638) are as follows:—(1) Injury by a blow given with the blood-stick. (2) Laceration or tearing (instead of clean cutting) of the wound, as might happen from the use of a blunt instrument. (3) The fact of more wounds than one being made in the part. (4) Failure to make the wound in the direction of the vein, *i.e.*, longitudinally (Möller). (5) The introduction, into the wound, of decomposing matter, which, when this takes place, is generally obtained from the blade of the instrument; but may also be communicated by unhealthy surroundings. (6) Undue irritation, sufficient to set up suppuration, as happens, for instance, when the part gets rubbed by the animal, soon after the operation. (7) Failure in bringing the edges of the wound correctly together. (8) A bad condition of the animal's system, which will prevent the wound readily healing.

I believe that an ill-aimed blow with the blood-stick is the not unfrequent cause of inflammation, which follows bleeding with a fleam far oftener, than bleeding with a lancet.

NATURE.—As long as the walls of the blood-vessels are in a healthy condition, the blood which circulates in these vessels exhibits no disposition to coagulate (p. 12); but if the walls become diseased or hurt, a clot of greater or less size will form at the seat of injury inside the vessel. The formation of pus, which is a diseased product, in a part bathed by blood, also excites coagulation of that fluid. As it is almost impossible to obtain under strict antiseptic conditions, healing of the wound made in the operation of bleeding; a clot is probably deposited in every instance. If the wound heals in an ordinary healthy manner, the clot, which will then be of a comparatively small size, will become absorbed, and the circulation of the part will be restored. In olden days, when it was a routine practice to bleed both men and horses at least once a year, the repeatedly operated-upon vein kept, in many cases, its circulation unimpaired up to the time of death. The state of the health will, as in all other wounds, greatly influence the manner of healing. A blow or severe pressure on the outside of the vein, even without the skin being broken, may cause a clot by injury to the walls of the vessel. If, from the intensity of the injury or diseased action, the stoppage in the vein

be complete, fibrin will become deposited above and below the clot, as far as the blood is stagnant, so that the vein will be plugged up by a fibrous deposit or *thrombus*. Subsequently, circulation in the vein may become more or less restored, or the vein may remain permanently blocked up, in which case, loss of direct circulation through the vessel will be compensated for, in process of time, by the establishment of "collateral circulation," by means of branches of veins which communicate together above and below the wound. When pus (p. 15) forms in the wound, blood-poisoning may take place with or without *embolism*, which is the term applied to the plugging-up of distant vessels of comparatively small calibre, by broken-off particles of the thrombus being carried into the circulation. Such embolism is particularly liable to cause a fatal form of inflammation of the lungs, into which organ the blood that passes through the jugular vein, is carried in order to be purified before reaching the heart (p. 10 *et seq.*). Möller states that blood-poisoning from inflammation of the jugular vein is rare.

SYMPTOMS.—The only cases we need consider here are those in which the inflammation of the walls of the vein runs an unhealthy course, with the formation of pus and an extensive clot. The affected portion of the vein is swollen, hard, knotted, and painful to the touch. The surrounding tissues are more or less swollen, and the wound has an unhealthy and inflamed appearance, and discharges dark-coloured blood and pus. Abscesses may form in the clot. Inflammation of the lungs from embolism may be manifested by high internal temperature and great difficulty of breathing. For symptoms of blood-poisoning, see page 532. In favourable cases of blocking up the vein, the establishment of "collateral circulation" will in time relieve the distressing symptoms of brain disturbance which at first take place, owing to interference with the removal of venous blood from the head.

We can find out if this vein is in working order by pressing our finger on the jugular groove, at about the spot indicated by the arrow head in Fig. 43. If it be all right, it will be seen to fill with blood, above the finger.

TREATMENT.—Treat the wound antiseptically (p. 67), after bathing the part with warm water. If any abscesses form, open them freely and treat as directed on page 79. Avoid probing the wound or pressing on the thrombus (clot in the vein), lest embolism (see above) may ensue. Rub in "a smart cantharides blister along the course of the inflamed part, and a cure will be effected in a very short time. The blister is to be applied, whether suppuration be present or otherwise" (*Williams*). The vein may be tied (ligatured) either below the thrombus or both below and above it, as the case may indicate. The horse should not be made to feed with his head low down, as that would greatly increase the difficulty the blood already has of making its way to the heart.

Inflammation of the Testicles from Injury.

CAUSE.—While in India, I saw several cases of this complaint among race horses that were trained or raced on sandy courses, especially when the ground had an admixture of small stones on its surface. Under such circumstances, the injury was no doubt inflicted by hard objects thrown upwards and backwards by the fore feet of the animals in question. I have never seen it occur on courses covered with horse dung, like that at Calcutta; or on those laid down with tan, like that at Cawnpore, when I was Honorary Secretary of the Races at that station. Colonel John

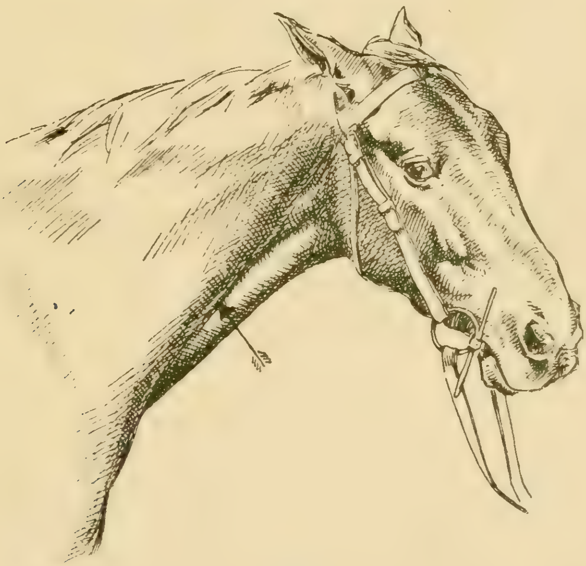


Fig. 43.—Jugular vein.

Anderson, A.V.D., was the first to draw my attention to this cause of inflammation of the testicles (orchitis), when I was staying with him at Poona, where horses frequently hurt themselves while being trained on the race course of that place, which at that time was just the kind of track, to favour the occurrence of this accident. This disease is also brought on by other injuries of various kinds.

SYMPTOMS.—Heat and tenderness of one or both testicles, with more or less lameness in some cases. Matter (pus) may form at the seat of injury, and watery fluid (serum) may accumulate at the lower part of the scrotum.

TREATMENT.—Keep the animal "low," by giving him Epsom salts (p. 609) and green food. Bathe the part frequently with warm

water, and support the testicles with an improvised suspensory bandage, adjusted over his croup. The injured testicle or testicles can be smeared over every day with an ointment composed of equal parts of glycerine and extract of belladonna, or painted over with iodine liniment. If an abscess forms, it should be opened with a knife, and treated antiseptically (p. 67). If serum accumulates, it should be let out, by puncturing the skin, previous to doing which, the testicle should be lifted up, so that it may not be wounded. In severe cases, give a ½oz. iodide of potassium daily in the drinking water.

CHAPTER VII.

Malignant Tumours.

BOTRYOMYCOSIS—SCIRRHOUS CORD—ACTINOMYCOSIS—MELANOSIS.

The general meaning of a tumour is a "swelling." The most readily observable characteristics of malignancy in a tumour are: a tendency to recur if locally removed; to extend to tissues other than that in which it first appeared; and to invade distant parts. These properties are of course absent in benign swellings, such as splints, warts, and capped hocks.

Botryomycosis

is a diseased state of the tissues set up by the presence of special micro-organisms, which Rivolta found in scirrhous cord in 1879, and which he called *discomyses equi*. They are also termed *botryomyces*. They are often met with in scirrhous cord, poll evil, fistulous withers, and in tumours which form on various parts of the surface of the body. In all these cases, they appear to act as an aggravation of an already existing wound, and not as an original cause. It is probable that the Indian disease, bursatee, is due to an allied parasite. Cadiot and Almy state that the majority of fibrous tumours which have suppurating sinuses, are due to botryomyces. Bollinger has found these microbes in fibrous tumours in the lungs, and has given the name of botryomycosis to the disease originated by them. It appears that these parasites, like actinomyces, find a favourable residence in decaying vegetable matter; hence an objection to bedding-down horses with open wounds (such as those inflicted by castration), on peat moss, seems to be reasonable. The irritation caused by the presence of this fungus, gives rise to a growth of fibrous tissue which has a tendency to degenerate and break up in the form of pus.

TREATMENT.—Remove the tumour with the knife or other suitable means; and, as described for scirrhous cord and actinomycosis, treat locally with an antiseptic, and generally with iodide of potassium.

Scirrhous Cord

is a swollen and hardened condition of the spermatic cord from which the testicle has been removed.

The microbes of botryomycosis are often met with in scirrhous cord, and are probably the cause of the sinuses and suppuration of bad cases of this disease, but they are not its producers. Leblanc (Cadéac's "Ency. Vétér.") points out that these parasites are never found in a recently formed scirrhous cord which has not a sinus.

SYMPTOMS OF SCIRRHOUS CORD.—In this disease, a mushroom-like (hence its French name, *champignon*) swelling forms at the end of the divided cord, and thus gives the tumour the appearance of growing from a stalk or pedicle. Or the swelling, beginning at the end of a cut cord, may extend upwards in the substance of the cord, assuming more or less the shape of an elongated cone. In the former case, it may remain outside the scrotum, and may hang down to a considerable extent, even as low as the hocks, as observed by H. Bouley. In the latter, it may go as high as the inguinal canal, or even into the abdomen. The affected part of the cord becomes hard and greatly swollen, even to the size of a man's fist, or to the thickness of his arm. In well-developed cases, one or more sinuses form at the end of the tumour, and discharge thick curdy pus. The scrotum always becomes closely adherent to the tumour, which in some instances may be seen in a cup-like depression made by the skin round the edges of the wound. The invaded portion of the cord becomes filled with blood-vessels from that part of the scrotum to which it is adherent, and consequently becomes more or less red. Owing to the presence of the tumour, which may be single or double (affecting one or both cords), the movements of the hind limbs, especially those of the affected side, become more or less impeded. The pain, inconvenience, and discharge may give rise to fever and loss of condition. By passing the hand into the rectum, we may find out by the state of the cord, whether or not the tumour has extended into the abdomen.

PROGRESS OF SCIRRHOUS CORD.—I venture to think that in the progress of this disease there are two well-marked stages, namely (1) adherence of the scrotum to the end of the divided cord, and (2) suppuration in the tumour. The former stage may continue for years without merging into the latter. On the other hand, I

have seen a case of scirrhous cord become fully developed within three weeks after castration. In it, the lower end of the cord was of the thickness of a man's fore-arm, and had two sinuses which were about three inches deep, and which were full of thick pus. Old standing cases of thickened cord with adherence to the scrotum, but without suppuration, may be due to external irritation accompanied by increased vascularity, and not to the action of a parasite; although the part in them is particularly well-placed to become infected by such an organism. Death may take place by the debilitating effects of the disease, and by the tumour extending into the abdomen.

CIRCUMSTANCES PREDISPOSING TO SCIRRHOUS CORD.—As far as I know, the only circumstances which predispose a horse to this disease, are: division of the cord too low down; undue pulling on the cord, as might happen during castration; and adherence of the edge of the scrotal wound to the end of the divided cord. The natural tendency of the wounded surfaces of the scrotum will be to adhere to the end of the cord, if the cord be left sufficiently long to permit of such union taking place. If this adherence be prevented, the cord will soon, by retracting, remove its wounded end beyond the influence of outward irritation and contamination.

TREATMENT.—Whenever practicable, we should lose no time in attempting the complete removal of the tumour. In doing this, I would recommend that the first operation, by being thoroughly radical, should of necessity be the last. I must, however, say that Mr. W. R. Davies and other veterinary surgeons have had entire success with partial removal of the tumour, and subsequent antiseptic treatment. In operating, I would advise that the horse be made to lie down in the manner described on page 641 *et seq.*; put under chloroform; placed on his back; and his hind legs drawn up by side lines as in castration, and kept in this position by a bag full of straw propped up against each side of him.

Undoubtedly, torsion (p. 654) is the best method by which to perform the operation of removal; for, by it, we make certain of the division taking place in the sound part of the cord, which being free from the new formation of fibrous tissue, is not so tough as the affected portion. Mr. E. Bailey, M.R.C.V.S. of Leicester, who has removed scirrhous cord according to this method in a large number of cases, informs me that he has been invariably successful in effecting a complete cure by it.

Having secured our horse, we begin by making a circular or oval incision through the skin of the scrotum round the end of

the enlarged cord; and then carefully dissect away the skin until it is entirely separated from the tumour. Although it is advisable to do this as much as possible with the fingers (for torn blood-vessels will not bleed as freely as clean-cut ones); we can make but little progress in well-developed cases without a free use of the knife. We should, however, when employing it, carefully note the position of the many newly-formed veins, which manifest themselves by their blue colour, and which we should ligature before cutting through them on the tumour side of the ligature. The tying of one of these veins may be performed by passing underneath it a curved suture needle, through which a piece of silk or stout thread has been threaded, and tightly closing the vein by a reef knot (Fig. 32, p. 73). While this dissection is taking place, the operator should have an assistant to instantly remove the blood from the exposed surface by pressing on it for a moment a sponge out of which moisture has been squeezed. The assistant should have two sponges to use by turns, and a pail of water in which to

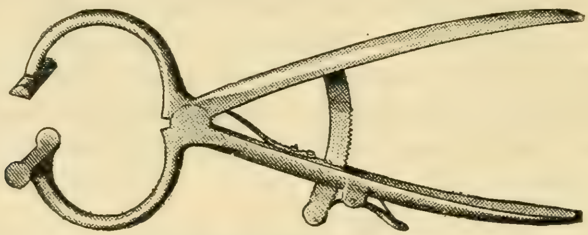


Fig. 44.—Torsion forceps.

clean them. The operator should have at hand an artery forceps to pick up, and twist if necessary, any blood-vessels which he may inadvertently cut before ligaturing them. Owing to the fact of these veins having a large calibre compared to the thickness of their walls, ligaturing will be more effective for closing them than twisting.

When the tumour is thoroughly free from the previously adhering scrotum, we may take it in our hands and twist it round and round, until the cord gives way. To complete the severance, we may use a torsion forceps (Fig. 44). After the tumour has been removed, we should freely apply to the part, by means of a syringe, a suitable antiseptic solution (p. 67) such as one of carbolic acid or creolin in water (1 to 20). Our subsequent treatment will be similar to that after castration.

Nocard has had great success in the treatment of scirrhous cord by the daily administration of $2\frac{1}{2}$ drachms of iodide of potassium, which amount may be largely increased (p. 127). By using $\frac{1}{2}$ oz. a day of iodide of potassium without any other means, I have had entire success in the treatment of scirrhous cord. Some authori-

ties recommend that instead of iodide of potassium, biniodide of mercury (p. 128) should be employed. This treatment, in the event of removal by surgical means not being adopted, may be supplemented by injecting a couple of times a day, liniment of iodine, into the sinus or sinuses with a syringe, or into the substance of the tumour by means of a hypodermic syringe.

Actinomycosis

is a disease caused by the ray-fungus (actinomyces). "According to Brazzola, it grows principally on *Hordeum marinum* (a kind of barley). Upon the fragments of this grain which had penetrated into the gum, he has found a mass of actinomyces among the vegetable fibres. Johne and Piana have met with this fungus on the husks of wheat fixed in the tonsils and in the tongue of an ox" (*Friedberger and Fröhner*). It seems probable that it gains entrance into the system only through a wound. In the vast majority of cases it is confined to cattle. It is occasionally found in men, seldom in pigs, and very rarely in horses. Blanchard states that carnivorous animals do not take it, even by inoculation. Vachetta, however, reports a case of it in the dog. Hammond has seen it in a sheep. In cattle, men, and horses, it is essentially a disease, at first, of the skin and mucous membranes, from which it extends to the underlying tissues. In cattle, the tumours are known as wens, clyers, crewels, sitfasts, polypus, cancer of the tongue, cancer of the jaw, spina-ventosa, osteo-sarcoma, etc. (Crookshank). It has frequently, as in Australia, been mistaken for tuberculosis. Liebman has shown that this fungus, if inoculated in a grain of corn, will grow according as the grain becomes developed, and that it will invade the whole of the plant. He also points out that the fungus, by residence in the animal body, loses to a certain extent its contagious power; but regains it when it becomes transferred to a vegetable host. This fact may account for the rarity of the disease among dogs and other carnivorous animals. There is very little evidence to prove that in ordinary course, it has ever been transmitted from one animal (including man) to another. Its usual point of entrance is no doubt by the mouth and with the fodder. It may be carried into the lungs along with dust. In cattle it not unfrequently forms a malignant tumour in the jaw by gaining entrance by means of a wound on the gum, or through a decayed tooth. Nocard points out that the geographical distribution of this fungus is very erratic; it being frequent (among cattle) in some countries and districts, and absent in others. It is very rare in France; but is often met with in Holland, Russia, Scotland, and the United States.

The only cases of actinomycosis which I have read of in the horse are: one in the skin and underlying tissues of the thigh, subsequent to a wound, reported by Perroncito; and instances in the tongue, described respectively by Zschokke, Truelsen, Israël, Baracz, and Gruber.

SYMPTOMS.—In the only case I have met with in the horse, the tongue, on the first day that I saw the animal, was swollen to at least four times its thickness in health; was as hard to the touch as a piece of cartilage; and had lost all its power of motion, except a slight backward and forward movement. The end of the tongue had a mottled appearance, being covered partly with purple patches of congestion; partly with yellow patches. Further back, there were two deep grooves, one on each side, corresponding in size to the back teeth, which had evidently excavated them, during the backward and forward movements of the hard and greatly swollen tongue. Connecting the front portions of these grooves was a transverse furrow, which was so deep (at least, two inches) that I had to be very careful in manipulating the free end of the tongue, lest I might detach it from the fixed portion. This transverse groove contained a comparatively large quantity of hard yellow nodules (Fig. 45) of fibrous tissue. The wounded surface of the tongue was of a very dark red, almost black colour, and showed no granulations or any other signs of the formation of pus. The horse, a handsome three-year-old thoroughbred entire, was able, with the greatest difficulty, to eat only a very small amount of grass; for he "quidded" by far the greater proportion of the grass which he took into his mouth. He was quite unable to eat hay or oats, and there was a constant and copious discharge of saliva from his lips. Consequently, he was in terribly bad condition, and appeared to be on the point of dying of starvation. The tongue was extremely painful to the touch; apparently because the nerves of the part, on manipulation, became pressed against the hard fibrous nodules which were embedded in the tongue and which I shall allude to more fully further on. The mouth exhaled a stinking odour.

Friedberger and Fröhner state that "when the tongue is affected, prehension and mastication are impeded. The organ is swollen, painful to the touch, and there is an abundant flow of saliva." These writers mention that although the tumours (which vary in size from a pin's head to a broad bean) are generally soft, they are sometimes of a fibrous consistency and of a greyish white colour; resembling, in fact, those of the case I treated. Crookshank states that actinomycosis in the tongue appears "most commonly in the form of nodules or wart-like patches under the mucous mem-

brane with a special tendency to ulcerate from the irritation of the teeth." The characteristic hardness of the affected tongue, which has caused the disease to be referred to in various countries as "wooden tongue," *Holzzunge*, and *langue de bois*, is due to inflammation of the substance of the tongue, set up by the presence of the fungus. The tumours, wherever they may appear, may be hard, as I have described, or soft, and may, like those of scirrhous cord, degenerate, with the formation of pus, in which the fungus can be found.

TREATMENT.—The treatment which I successfully adopted was as follows:—Learning that the animal had been getting $\frac{1}{2}$ oz. of iodide of potassium daily, and seeing that the amount had failed to check the course of the disease, I began by giving 2 oz. of that drug daily in the drinking water; and found after three days of this treatment that the tongue had decreased in size, was softer to the touch,

Fig. 45.—Nodule of actinomycosis
(actual size).

and had lost its fœtid smell; and that the patient was able to eat better. During the following 38 days, I gave the animal 52 oz. of iodide of potassium, without producing any of the characteristic signs of iodine-irritation in the system, such as running at the eyes and nose, which are quickly apparent in man from an overdose of this medicine. The only untoward effect produced in this case by the immense doses which I was giving and which I varied according to circumstances, was difficulty in staling. This complication was in no way serious, and soon passed off after the removal of its exciting cause. Every day, after having thrown the horse, I scraped with a finger nail all the exposed nodules I could reach, and applied to the wounds in the tongue, at different times, tincture of iodine and eucalyptus oil daily, and a solution of 20 grains of chloride of zinc to the ounce of water, every second day. The last-mentioned application I found to be by far the most effective of the three. As long as the horse's tongue was so bad that he was unable

to eat enough grass to sustain life, I gave him daily a dozen or more raw eggs. Under this treatment, the nodules which were in the free part of the tongue, and which had, in the first instance, manifested their presence in the substance of that organ only by yellow patches on its surface, gradually separated themselves from the surrounding tissue, and came away in the form of hard, granular nodules, which looked like pieces of greyish white or yellowish white coral, and which varied in size, as I have already said, from that of a pin's head to that of a broad bean. The separation of these nodules took place without any apparent inflammatory action, and consequently without the formation of a single drop of pus. The nodules which were embedded in the wounded surfaces, also became loosened, and readily came away by the touch of the finger nail. After six weeks of this treatment, all the nodules had disappeared out of the tongue, which had regained, to a great extent, its normal size, colour, consistency and action; the exposed surfaces had healed over; the flow of saliva had ceased; and the animal was able to eat his green meat and hay without the slightest attempt at quidding; had greatly improved in condition; and was in excellent health. In fact, I trained him for racing later on. For the first six months he had more or less difficulty in eating oats from the state of his tongue, the full use of which he subsequently recovered. I attribute these good results to the action of the iodide of potassium; for when I discontinued this drug on two occasions for three days, the symptoms of swelling and hardness of the tongue, running of saliva from the mouth, and adherence of the nodules to the surrounding tissues, began to increase in a marked manner, until I recommenced giving this medicine, when they began to abate with equal quickness. The fact of a young three-year-old horse being able to tolerate such an enormous quantity of iodide of potassium as this one took, is extremely interesting to students of veterinary medicine.

Instead of large doses of iodide of potassium, which is an expensive drug, good results have been obtained by giving twice daily in gruel about 5 grains of biniodide of mercury and 10 grains of iodide of potassium in an ounce of water. The iodide of potassium is added in order to render the biniodide of mercury soluble in water.

Melanosis

is a malignant new growth which occurs in various parts of the body. It appears in the form of dark-coloured tumours which gradually increase in size, and are usually situated on the lower, and sometimes on the upper surface of the tail, and about the anus, sheath and crest. When it affects the tail or crest, the hair over the seat of the disease falls out after a time. Melanosis is, with

but few exceptions, confined to grey horses, and usually appears after the ninth or tenth year, when the coat begins to turn white. It is much more common in India than it is in England; perhaps because the proportion of grey horses to those of a darker hue is much larger in the former, than in the latter country. The effect of light on the colouring granules of the pigment cells, may also have something to say to the larger percentage of cases met with in the hotter climate.

Melanosis is a disgusting disease when it is well developed. It is not alone an eyesore, but, also, from affecting the internal organs, it may permanently injure the horse's health, or even prove fatal to him. The animal's condition becomes more or less impaired by the irritation caused by the tumours, which will often, especially if subjected to friction, burst, and form unhealthy sores, which discharge a dark-coloured fluid.

TREATMENT, as far as I have seen and can learn, is of no use with cases of melanosis in horses. I have always found that cutting out the growth only caused it to appear somewhere else with increased virulence. I conclude that this undesirable result has been due to the fact that the removal has not been complete; for, in human practice, "in no form of malignant growth is resort to early and free excision of more importance to the patient than melanotic sarcoma or carcinoma" (*Jonathan Hutchinson, Junr.*).

CHAPTER VIII.

Parasitic Skin Diseases.

GENERAL REMARKS ON PARASITES—FLIES—LEECHES—MAGGOTS—LICE—TICKS—POULTRY MITES—MANGE INSECTS—PARASITIC RINGWORM—BURSATEE.

General Remarks on Parasites.

DEFINITION.—Parasites are organisms (either animal or vegetable) which live on *(ecto-parasites)* or within *(endo-parasites)* other organisms. They are divided into *parasites proper*, such as tape-worms, which live on the tissues of their hosts, and *commensals*, or guests, which feed on the food of their hosts. For convenience sake, I venture to enlarge this definition, so as to include insects which annoy horses by their presence.

ORIGIN AND HEREDITY.—Parasites of every kind, external, internal, microbic and non-microbic, obtain their origin from without. We have seen on page 21, that microbes may be conveyed by the blood of the dam to the fœtus. This mode of inspection would be rarely if ever possible in the case of non-microbic parasites. As like tends to produce like, and as certain states of health are favourable to the development of parasites in an animal, we may find hereditary predisposition more or less marked.

PREDISPOSITION AND PREVENTION.—As explained by Neumann, young animals are more liable to the attacks of certain parasites on account of their tissues being more easily pierced than those of older ones. The greater vascularity of their tissues may also be a further cause. As a rule, a state of good health in the horse is antagonistic to the development of parasites, which consequently invade debilitated and old horses, more readily than the strong and mature. We have here the question of "seed and soil." Locality also plays a large part in this connection. For instance, bots, practically speaking, infest only those horses which feed in the open; and leeches, only those that reside on or travel through ground in which these parasites live. The experience I have gained in many parts of the world convinces me that internal non-microbic parasites, with the exception of bots, are conveyed to the horse, as a rule, in the water he drinks and on the grass or other "green meat" he eats. The horse, being a clean eater, is comparatively free from internal non-microbic parasites. The majority of dogs, on the contrary, are infested with them. From these remarks we may see that our interests as horse-owners are concerned in obtaining for our animals, food and drink which are free from hurtful forms of life; in attending to the health of our horses; in protecting them from parasitic invasion; and in destroying all parasites got rid of by them, so that neither these parasites nor their progeny may become future sources of irri-

tation or disease. Some parasites are capable of producing millions of eggs in a year.

PLACE OF RESIDENCE AND METHOD OF INVASION.—The majority of these parasites are fairly constant in the selection of their residence. Those which live in the stomach and intestines, evidently effect their entrance along with the food and drink. The parasites which invade the internal organs or closed cavities like that of the abdomen, or the aqueous humour of the eye, do so by boring their way from the alimentary canal or by their eggs being carried in the blood stream to distant spots, and being deposited there in small blood-vessels, from which they escape on assuming a more developed form, or in which they make their stay. Owing to the acid character of the gastric juice, internal parasites, with the exception of bots, prefer the intestines to the stomach as a place of abode.

EFFECTS ON THE HEALTH OF THE HORSE.—As parasites feed either on the tissues of the horse or on food which, in their absence, would be available for the nourishment of the animal, and as their presence in no way conduces to the well-being of their host; they must be looked upon as undesirable visitors. At the same time, they may exist in considerable numbers without doing any apparent harm. On the other hand, they often seriously affect the health of the horse, and not unfrequently cause his death.

SYMPTOMS AND DIAGNOSIS.—The appearance of these parasites or of their eggs, is often the only sign that the animal is infested. Besides this convincing proof that parasites are either on or in the horse, I do not know any other sign by which we can absolutely say that a horse is suffering from their presence. The only symptoms to be observed are those peculiar to the conditions of ill-health, such as itching, pimples, indigestion, colic and paralysis, induced by them.

Flies.

For convenience sake I use the above heading in its popular, though not scientific acceptation, to denote those two-winged insects that annoy horses whether by wounding the skin, or by their presence on it, in which case they cannot of course be correctly termed parasites. Even in temperate climates, on summer evenings, and especially in wooded and marshy ground, gnats, " horse flies," and allied insects are often extremely irritating to horses; though far less so than in the tropics, where, probably, the most irritating of all, from their number and persistent attacks, are common house flies or flies nearly akin to them. In the hot weather, and particularly during the rainy season, it is often impossible to utilise with any comfort docked horses on account of these unfortunate animals being unable to defend their hind quarters.

Time not alone confers comparative racial immunity; but also more or less individual immunity. Thus we find that horses which have resided for some years in fly-stricken countries like India and South Africa, or are indigenous to such countries, suffer far less from the attacks of flies than recently imported horses. The same law holds good with human beings, as we may see by the extreme sensitiveness of the skin of a recent arrival in the East, to the bites

of mosquitoes, and the indifference displayed by Egyptian children to the presence of flies on their faces and even in the corners of their eyes.

Against these insect pests, the chief treatment is of course that of prevention. With this object, we should allow a horse his utmost length of tail, mane, and forelock, and should remember that the chief function of the mane is to assist in driving away flies which may settle on the neck. Eye fringes and ear nets are often indispensable; and a hood and light body clothing may be useful As an application to render the skin obnoxious to these enemies of the horse, we may employ a strong decoction, in vinegar, of walnut leaves; train oil; a strong solution of salt in water; a solution of creolin in water, 1 to 20; or, as recommended by Miss E. A. Omerod, a mixture of flowers of sulphur, 4 oz., spirits of tar, a quarter of a pint, and train or whale oil, one quart. In India, smoke obtained from burning dried cow dung or dried horse dung is often used to keep flies out of stables, which, with the same object, may be kept dark. If there be only one entrance through which light enters the stall, a net spread across it will effectually prevent flies from gaining admittance; although, if light be allowed to come in from another direction, the net will have no deterrent effect, unless its meshes are sufficiently small to prevent entrance. The cleaner the stall is kept, the less inviting will it be to flies, which will also be warned off to some extent by the free use on the floor and walls of a solution of creolin or carbolic acid in water (say, 1 to 20), or some other strongly-smelling disinfectant.

Leeches.

In many hot countries, and especially on damp ground, various kinds of land leeches (see also p. 395) attach themselves to the legs of horses which go through places infested by these bloodsuckers. They are best removed by sprinkling a little salt over them, or they can be snipped off with a scissors. The legs of the horse may be protected by bandages; flannel or serge for choice.

Maggots.

Under this vulgar though convenient term I wish to include the larvæ of various forms of flesh flies, and the larvæ of the warble fly. The former deposit their eggs on wounds; the latter (*Hypoderma equi*), on the skin, into which the larva penetrates in a manner that has not been ascertained up to the present, and forms under it a warble similar to those very frequently found on the

backs of cattle. These attacks on horses are made only by female flies.

In the tropics I have seen many instances of sores in ill-kept horses becoming "fly-blown" (filled with maggots). Warble flies rarely attack horses in England, but do so in various parts of Europe and South America. The larva is about two-fifths of an inch long, being a good deal smaller than that of the warble fly of the ox, which it closely resembles in its method of development. In Europe, the warble fly lays its eggs on the back of the horse generally in August. The larva forms a tumour under the skin, becomes mature in June or July, leaves its temporary abode, and after concealing itself for about a month in or on the surface of the ground, bursts forth as a fly. While in the tumour on the back of the horse, the presence of the larva not only causes an abscess to form; but the parasite also imbibes blood from its host. In the treatment of these warbles it is well to remove them without delay, by enlarging the orifice with a touch of the knife, and by taking out the larva with a forceps. The sac should then be filled with some suitable antiseptic (p. 67), eucalyptus oil or turpentine for choice. The larvæ should be destroyed by some effective means, such as fire or boiling water; for if they be thrown away, they will almost to a certainty be productive of flies which, in the case of a female, will be capable of producing an immense quantity of eggs.

Lice

which closely resemble those of man, are sometimes found on ill-kept horses. They prick the skin so as to feed on the blood and discharge which issue from the wounds they make. They may be observed, accompanied by their nits and cast-off skins, on the skin of their favourite haunts, which are the roots of the tail and mane, the hair of which, when affected, stands up and becomes matted. Horse lice are of three kinds, and vary in length from one-seventh to one-fourteenth of an inch. The animal suffers a great deal from itchiness, and avails himself of every convenient object against which to rub the affected parts. Clipping and careful grooming are generally sufficient to remove these parasites and their nits (eggs). As applications, we may use stavesacre ointment; a decoction made by boiling an ounce of tobacco in a pint of water; or an ounce of carbolic acid or creolin in a pint of water.

Ticks *(Ixodes)*

similar to those found on dogs, are found in almost all countries on horses which graze in the open. South African horses that

live on the veldt, are generally infested with them. The females cling to the horse's skin by means of their teeth, and fill themselves with blood, in doing which they cause little or no irritation to their host. They are best removed by dropping a little turpentine or paraffin oil on them, on the application of which they will relax their hold and fall off. Or they may be snipped off with a scissors, when the head, which remains attached at the time, will soon dry up and fall off. They should not be pulled off; for if that be attempted, the piece of skin by which the parasite has maintained its position, will become lacerated by the teeth of the tick, and a troublesome wound may result. The advisability of throwing the detached tick into boiling water or fire is manifest.

Poultry Mites *(Dermanyssus gallinæ)*.

The poultry mite belongs to the same order (*Acarina*) as the mange insect of the horse and the itch insect of man, and is about a fortieth of an inch in length. These parasites, which infest ill-kept poultry and pigeons, are apt to settle on the horse, if these birds be allowed free entrance into the stable, or if they be kept close to it. They cause intense itching of the skin. As they can live for only two or three days away from their natural host; removal of the birds or of the horse will constitute the only treatment required. If an application be considered necessary, we can use an ounce of creolin, or Jeyes' Fluid, to a pint of water. They freely attack human beings who come in contact with infested birds, or who sit down on coops occupied by them.

Mange Insects.

Mange is a contagious disease caused by the presence of a small insect that varies in length from a fortieth to a hundredth part of an inch, according to the species, of which there are three. One of the species (*sarcoptes*) and the itch insect of man are varieties of the same parasite.

PREVALENCE.—I am led to believe from the experience of many careful observers, that mange is a somewhat rare disease. The term, however, being a convenient one, is often indiscriminately and incorrectly applied to any skin eruption which, like true (that is, parasitic) mange, is accompanied by itching and the formation of scabs.

VARIETIES.—The following are the three species of these insects:—

1. The most common form of mange insect is *psoroptes*, which chiefly invade those parts that are covered with "horse-hairs," and consequently infest the mane and tail, from which they may spread to the space between the branches of the lower jaw, the breast, and thighs. As they live in colonies, their seat of attack may at first be within narrow limits, which gradually extend outwards. In this way, the invaded portions of skin become united, until a considerable surface is implicated. Owing to the more settled habits of these parasites, this kind of mange is not so contagious as the second (sarcoptic) form. The punctures made on the skin by these insects give rise to an eruption of small pimples, which at first are of the nature of blisters. When these blisters burst or are broken by friction, a discharge of serum and pus issues from them and keeps the affected parts in a moist condition, which serves to distinguish this kind of mange from sarcoptic mange. The parasites live on the surface of the skin and under the crusts which are formed by the drying-up of the fluid from the pimples and by the scaling-off of the scarf-skin. Owing to the irritation caused by the wounds made by the insects and by the animal rubbing himself; the skin becomes thickened, hardened, wrinkled, devoid of hair, and more or less covered with sores.

2. The insects (*sarcoptes*) of the second form of mange generally commence their attack on or near the withers, from which they spread over the neck and trunk. Their punctures cause an eruption of small pimples which become filled with serum that soon dries up and forms crusts over the pimples. On this account, when the affected skin, during the first stage of the disease, is felt by the fingers, it presents to the touch a number of granular eminences. If one of the crusts is scratched off, it will leave on the skin a raw spot about the eighth of an inch in diameter. As the serum contained in the pimples dries up quickly, the skin in this form of mange will present a dry appearance. The scarf-skin more or less scales off, and the hair falls out. In the later stages of the complaint, the skin becomes thickened, rough and wrinkled. Vertical wrinkling of the skin, neck, shoulders, and sides is always present in advanced cases of sarcoptic mange. Each pimple is the result of a pregnant female parasite penetrating the scarf-skin, and irritating the underlying sensitive tissues with her venomous saliva. She then burrows underneath the scarf-skin and away from her point of entrance to a distance of about half an inch, so as to form a tunnel or gallery, in which she lays her eggs as she goes along. Consequently, by the time a pimple forms at the inoculated spot, the egg-bearing parasite has left it, and cannot be found if a search be made for her in the pimple, vesicle, or scab. In a white-skinned human subject (affected by itch), the position of the characteristic

gallery is marked on the skin by a red line, which somewhat resembles the scratch of a pin; but it is not visible in the skin of a horse, owing to the thickness of the scarf-skin of that animal. If a pin be pushed into the gallery, the parasite can be removed at the point of the pin. The male parasites (which form only about a twentieth of the entire number), the unimpregnated females, and the larvæ reside among the crusts on the skin. Although the disease may be fully established on some portions of the skin, which will consequently become thickened, thrown into folds, and bald; it may be in its first stages on other parts, upon which the grain-like eminences made by the newly-formed crusts, can be felt among the hairs of the coat. The disease takes from one to two months to become fully established. Rubbing the affected surface, and manifestation of pleasure when the mangy spots are scratched with the fingers, are prominent features of the complaint.

3. The insects of the third form of mange are called *symbiotes*. Their invasions are confined practically to the legs, and extend very slowly from one part to another. They commence their attack at the back of the pastern, and work upwards; but rarely go higher than the knee and hock, and are seldom found except on coarse, hairy-legged animals. They affect the hind limbs oftener than the fore, and those of young horses more frequently than those of old ones. Strange to say, they manifest their presence as a rule only during winter; the probable reason of this being, as explained by Neumann, that the excretions from the skin during the summer are sufficient for their nourishment. Possibly for a similar reason, namely, that the skin is more active during work than during repose, the horse suffers more from their attentions at the latter time, than at the former. The symptoms are: itching; the formation of crusts, cracks, and sores; thickening of the skin; and falling-out of the hair. When the pasterns are affected, the symptoms may resemble those of grease or grapes (p. 156). "At the commencement of the attack, the only important symptom which attracts attention, is the habit which the mangy horse has when he is at rest, of abruptly striking the ground with a hind foot for hours at intervals and especially during the night. Some horses kick. All scratch and bite the fetlocks" (*Friedberger and Fröhner*).

ERUPTION.—The nature of the eruption is due to the venomous bites of the insects and to friction in the efforts made by the suffering animal to relieve itself from the itching by scratching or rubbing itself.

ITCHING.—The itching appears to be caused by the irritating saliva which these insects deposit on the wounds they make in

the skin, with the object of producing and obtaining serum (the fluid contained in a blister) for their food. The intensity of the itching is proportionate to the number and state of activity of these insects, which, in the two commonest forms (psoroptic and sarcoptic) of mange, are more or less dormant under the influence of cold, and busy under that of heat. Hence this itchiness is particularly observable at night when the horse is well clothed and comfortably stabled. Gerlach has shown by experiment that the saliva of the psoroptes is more irritating than that of the sarcoptes, and consequently that the itching produced by the punctures of the former is more intense than that caused by those of the latter. The itching of symbiotic mange is much less severe than that of the other two.

PREDISPOSITION.—There seems to be no such thing as predisposition to mange beyond the fact that on ungroomed horses, the parasites are given greater facilities to invade the skin and to increase in number, than on animals whose coats are carefully attended to; and that young horses, according to Raillet, are much more liable to contract symbiotic mange than older ones.

CONTAGIOUSNESS. — Sarcoptic mange, owing to the roving habits of its parasites, is extremely contagious, especially when it has assumed a chronic form; and may be communicated even by brief contact, and by the medium of clothing, bedding, stable gear, etc. The psoroptic form, though less contagious than the sarcoptic kind, can be readily transmitted from one horse to another. Symbiotic mange is but little catching.

COMPARATIVE GRAVITY.—Psoroptic mange is a less serious disease than the sarcoptic kind; for, by reason of the more stationary habits of the parasite, it spreads more slowly, and is less contagious; and, owing to the fact that the insects do not burrow into the skin, it can be more readily cured. When sarcoptic mange has spread all over the horse's body, it may be regarded as nearly if not quite incurable. Even when recovery is possible, it will require several months of persistent treatment. Trasbot points out that psoroptic mange is sometimes incurable in entire horses which have their crests very deeply wrinkled. Symbiotic mange is in every way a milder disease than the other two.

VITALITY OF THE PARASITES.—According to Gerlach, psoroptes may live under favourable circumstances, when removed from their host, as long as two months; sarcoptes, about half that time.

INCUBATION.—The period required for the eggs of the mange insect to become hatched, varies according to temperature, within,

of course, reasonable limits. We may put the period at, under ordinary circumstances, from two to ten days. According to Gerlach, the eggs may remain fertile for a month.

DURATION OF THE DISEASE.—Mange, in both the psoroptic and sarcoptic forms, shows no tendency to spontaneous recovery. The same might be said of symbiotic mange; although it is possible in some cases that this disease may disappear with age, or with ordinary grooming.

EFFECT ON THE GENERAL HEALTH OF THE HORSE.—Sarcoptic mange greatly affects the general health, especially if it be allowed to run its course unchecked, in which case it may not improbably cause death. During the Crimean campaign and the Franco-German war, great numbers of horses died from the effects of this kind of mange, aided by hardships and privation. Psoroptic mange, owing to its slower spread, has not such quickly acting ill-effects; although it also has a very debilitating influence, which, in neglected cases, may have a fatal result.

TRANSMISSIBILITY OF MANGE TO OTHER ANIMALS.—As the parasites which produce sarcoptic mange (or itch) in, respectively, men, horses, dogs, foxes, etc., are varieties of the same insect (*sarcoptes scabiei*); the sarcoptic parasites of one species of animal will, if transferred to the skin of another species, attack it as a rule. In all cases, the occupation seems to be but temporary, probably, not exceeding a month in duration; although the disease might be kept up by fresh importations of parasites. Among troops, and especially on active service, there have been several instances, which must, however, be regarded as exceptional, of cavalry soldiers suffering a great deal from the attacks of sarcoptes from mangy horses. On the other hand, the itch insect of man—whether on account of the horse's skin being thicker, or by reason of lack of numbers—is but little formidable to the horse. Hence, there is not much objection to men, who are afflicted with itch, grooming sound-skinned horses: of course, under circumstances of necessity.

DIAGNOSIS.—The only sign by which we can authoritatively determine the nature of the complaint, is the presence of the parasite. It is much more difficult to do this with the sarcoptic form than with the other two, owing to the burrowing habits of its parasites, and to the fact that it is only about half their length and breadth. In order to find the insect, Neumann advises us to scrape the surface of the affected skin with a knife, through the scarf-skin

until we draw blood, and gently heat the crusts thus collected before a fire or in the sun. We may examine on a glass plate a small amount of this dust by direct light by means of a microscope magnifying 40 or 50 diameters. Warmed by sunlight, the insects can then be seen moving about. If we wish to examine them more carefully, we may remove specimens from the dust by the point of a needle, put them on a drop of glycerine on another glass, place over them a covering glass, and put them under a microscope magnifying from 150 to 500 diameters. Or we may place the warmed crusts on black paper and examine them with a strong magnifying glass, which will be sufficient to show us any psoroptes or symbiotes that may be present. Or we may soak the crusts for a couple of hours in a ten per cent. solution of caustic potash, which by its power of dissolving albumin will free the insects from the *débris* with which they are surrounded, and then put the now colourless crusts under a cover glass.

Sarcoptic mange may be mistaken for that due to poultry mites; and *vice versâ.*

TREATMENT OF THE VARIOUS KINDS OF PARASITIC MANGE.—Here, our first object is destruction of the parasite. In using applications for that purpose, we must guard against irritating the skin too much; producing symptoms of poisoning by absorption; and injuriously interfering with the function of the skin, which we might do by covering too large a surface with oily or fatty matters. Our treatment of an invasion of sarcoptes should extend over the whole surface of the body, on account of the roving habits of these insects; but not more than half of the body should be dressed at one time. Unless the coat is short, we should in all cases clip the horse (generally, for the sarcoptes; locally, for the other two). In psoroptic mange, as recommended by Neumann, we might, in order to disfigure the animal as little as possible, clip the hair of the affected parts of the mane only in the furrows of the wrinkled skin; and make transverse openings through the hairs of the tail to facilitate cleaning and dressing the part. If this clipping cannot be done on some unfrequented spot, so that the insects may not have the chance of making a fresh invasion, the removed hairs should be collected together and burnt. Our next care should be to expose the parasites as much as possible to the action of the agent we intend employing for their destruction, by washing the parts thoroughly, which we may do by rubbing soft soap into them, and then scrubbing the surface with a brush and warm water, to which we may with benefit add a quarter of an ounce of carbonate of potash to the quart of water. As an external application we might advantageously use any of the following:—

(1.)	Creolin	1 oz.
	Water	1 pint.
(2.)	Creosote	$\frac{1}{2}$ oz.
	Alcohol	5 ,,
	Water	12 ,,
(3.)	Corrosive sublimate	20 grains.
	Dilute prussic acid	2 drachms.
	Water	1 pint.
(4.)	Sulphur ointment.	
(5.)	A decoction made by boiling an ounce of strong tobacco in a pint of water.	
(6.)	Sulphur	2 oz.
	Oil of tar	2 ,,
	Common oil	1 pint.
(7.)	Kerosene (paraffin) oil	1 part.
	Common oil	2 parts.

Trasbot strongly recommends a mixture of three parts of benzin, and one part each of oil of cade and coal-tar.

If we use one of the oily applications or a solution of tobacco for sarcoptic mange, we should dress only one half of the body at a time; and the other half, a day or two afterwards. Paraffin oil is apt to have an irritating effect on the skin, and by absorption may give rise to symptoms of poisoning, which may also be set up by the use of corrosive sublimate or mercurial ointment. At the same time, it is such an effective parasiticide, and can be so easily procured, that it is second to none as a basis for a mange dressing. If, by irritating the part, the proportion of paraffin oil be found to be too large, it may be lessened by adding more common oil to it. The employment of corrosive sublimate and mercurial ointment might be limited to cases of psoroptic or symbiotic mange, in which the surfaces treated are of much less extent than in sarcoptic mange. Two or three days after the first application, we may wash the skin as before, and repeat the dressing.

We should not unnecessarily continue the applications or use them too strong, lest we may set up an irritable condition of the skin, which we may have difficulty in distinguishing from the original complaint. Symbiotes require far less energetic measures for their eradication than either of the two other kinds of mange parasites. As the eggs and egg-laying females of the sarcoptes are concealed in galleries underneath the scarf-skin; the treatment of this form of mange should be continued, off and on, for about a fortnight, by which time we may expect that all the eggs will be hatched, and the young ones destroyed on coming forth.

As mange is solely due to the presence of a parasite, whose attacks can in no way be modified by the internal administration

of medicines or special forms of food, given with the view of improving the general health of the animal or the health of his skin; we should limit constitutional treatment to those cases in which the disease has produced debility that calls for relief.

DISINFECTION.—Horses infected with mange should be strictly isolated from healthy ones. The bedding, after it has been used, should be removed and burnt, or deposited in some place where it would not be a source of contagion. The stall or box and its fittings should be scrubbed and washed out with a plentiful supply of boiling water, and afterwards with a solution in water of chloride of lime (1 to 10), creolin (1 to 6), or of corrosive sublimate ($\frac{1}{2}$ oz. to 1 gallon). The clothing, dusters, brushes, curry combs, bits, stirrup irons, curb chains, etc., should be placed for a few minutes in boiling water, or immersed in one of the solutions just mentioned. We should bear in mind that the corrosive sublimate solution has an injurious action on iron and brass work. Articles of leather may be placed in boiling water for about half a minute, or into the solution of creolin or of corrosive sublimate. If the panels of saddles which have been in contact with mangy horses cannot be disinfected, either by being placed in boiling water or in an antiseptic solution, they may be kept in a moderately heated oven (say, about 200° F.) for half an hour, or destroyed.

Parasitic Ringworm *(Tinea tonsurans).*

DEFINITION.—Parasitic ringworm is due to the invasion of a fungus (vegetable parasite), which is met with on horses all over the world, and which has many varieties, as we may see by referring to Cadéac's "Encyclopédie Vétérinaire." I think it is more common among Irish horses, than among those of Great Britain. It is a mild disease, which readily yields to proper treatment, and which will often disappear of its own accord, especially under conditions of cleanliness and good grooming, because its food consists of the scales given off by the skin, and consequently their removal starves it. It is also seen on men, cattle, dogs, cats, and other animals.

This fungus penetrates into the hair follicles, in which it sets up inflammation, and attacks the hairs, making them dry and brittle, so that they readily break.

CONTAGIOUSNESS AND VITALITY.—This disease is very contagious among horses; the chief means of infection being saddlery, harness, and stable implements. I have seen frequent instances of saddles which had been used with animals suffering from ringworm, produce the disease in several other horses upon whom they

were respectively put. It can be communicated from horse to man, and *vice versâ;* though not with anything like the same facility as from horse to horse. It is much less severe in horses than in human beings. The parasites, away from their hosts, as when they have got into the panel of a saddle, will retain their vitality for a long time, certainly over six months, under favourable conditions.

SYMPTOMS.—Tinea tonsurans derives its name from the shaven appearance presented by the attacked portions of skin. It spreads by more or less circular patches which have a well-defined border, and which, commencing, say, with a diameter of from half an inch to an inch, do not usually exceed that of two inches. The affected patch of skin becomes bald (as if shaven) by the hairs breaking off close to the skin. The denuded surface as a rule presents but little signs of irritation beyond the fact of small scarf-skin scales being found on it. The elevated and inflamed condition of the border of the invaded patch of skin seen in cases of ringworm in man, is absent, or nearly so, in the horse. There is little or no itchiness. When this fungous growth has attained its full extent, which I have ventured to put down as a general rule, at two inches, it seems to die, and the hairs grow again as before, except that, for some time, their colour is darker, and they are drier and more erect than usual. Ringworm spreads from separate centres, which become infected usually, by the seeds of the disease being carried from one or more previously diseased spots in the same animal, and which may run into each other. It is found on various parts of the body (Fig. 46).

TREATMENT.—After washing the affected parts well in the manner described on page 139, we may apply either (1) or (7) recommended on page 140 for mange, once or twice a day as the case may demand. I have used 1 part of salicylic acid mixed with 6 parts of lard with invariable success, and without irritating the skin. I have had cases of ringworm which got well merely by good grooming. In South Africa, biniodide of mercury ointment (1 drachm to 4 oz. of vaseline or prepared lard) has always given good results. In human practice, 1 part of thymol to 18 parts of paraffin oil is an excellent application. A saturated solution of common salt is generally efficacious. The destruction of the parasite will be shown by the hair growing on the previously denuded spots. Constitutional treatment, by tonics and special articles of food, appears to have no influence on the removal of the parasite, which is the only treatment required.

DISINFECTION (p. 141) should be applied to the grooming utensils, saddlery and harness, the lining of which, in such instances of infection, will generally harbour the parasite.

Fig. 46.—Horse suffering from ringworm.

Bursatee

appears in the form of unhealthy sores which break out on the surface of various parts of the body. It is, as far as I know, peculiar to India, although somewhat similar sores are found in horses of other countries. Its name (*bursat* signifies rain in Persia) implies that it has a connection with the rainy season.

REASONS FOR CLASSING BURSATEE AS A PARASITIC DISEASE.—Although no specific disease germ has up to the present been found in bursatee sores; I have classed it as a parasitic disease for the following reasons:—

1. *Influence of altitude on its occurrence.* It is practically restricted to "the plains" in India. Although it may be found in a few rare instances at hill stations; such cases are simply exceptions to the general rule that it does not originate, nor does it continue its course in horses which are kept at elevations of about 5,000 feet or upwards above the level of the sea. It is most frequently met with in low lying districts.

2. *Influence of the water supply, and sanitation.* The purer the water supply, the fewer are the cases of bursatee; and *vice versâ.* Surgeon-Colonel Branfoot, who has had an extensive experience of horses in India, told me that, formerly, bursatee was very common in Madras, at which time, the water for stable use being procured from local sources, was much contaminated by low forms of life; but that the disease has almost entirely disappeared from that city, since the introduction of a pure water supply from neighbouring hills. I can vouch for the same fact, as regards Calcutta and other places in India. Although bursatee was very prevalent in Indian stables, say, thirty years ago, it is now comparatively rare; owing, apparently, to improved sanitary arrangements, of which the supply of purer water has undoubtedly been the most important factor in the prevention of this disease. It is practically unknown among horses whose stable management, feeding and watering are properly attended to.

3. *Efficacy of antiseptic measures in prevention and treatment.* Antiseptic treatment (which has a destructive influence on parasites) of wounds appear to confer immunity from bursatee on them. "In some of the late Bengal studs, every wound, even the smallest scratch, was smeared daily with a thick mixture of sulphur and oil, upon which no flies will settle. I have carried out this practice for many years, and have never known a wound so treated to assume a bursatic character" (*Meyrick*). If a bursatee sore is destroyed by the hot iron, or by caustics, and then protected from the action of

air and water, it will heal as an ordinary wound. Abrasions that occur during the hot weather in districts in which this disease is rife, are liable to turn into bursatee sores if neglected. Clean cut wounds (probably on account of the fact that they are generally treated antiseptically) seldom exhibit this tendency.

4. *Recurrence at a particular season of the year.*

5. *Recurrence on old sores.* Horses that have had this disease and that remain in the condition under which they have contracted it, are almost certain to suffer from its recurrence on the spots which have been previously affected, unless, indeed, the old sores have been completely destroyed by the knife, firing iron, or some strong caustic, and have healed under antiseptic precautions (p. 67 *et seq.*). An intending purchaser should therefore view with suspicion any bald patches indicative of bursatee which may be visible at its favourite seats.

6. *The formation in the affected part of nodules* (*kunkur*), which closely resemble those of actinomycosis (p. 126).

SYMPTOMS.—Bursatee appears in the form of hard chancre-like sores on the skin and mucous membranes of the mouth, eyelids, etc. The fetlock joints (especially), yard, sheath, front of the chest, face, lips, and tongue, are the usual points of attack.

The sores—one or more in number—generally make their appearance towards the end of the hot weather, assume their greatest virulence through the rains, and gradually heal up on the approach of the cold weather; though in old and neglected cases they may continue more or less open all the year round.

Colonel F. Smith states that the disease originates in the tissue immediately under the skin or mucous membrane, in the form of a small hard nodule which is painful to the touch, and is accompanied by heat and swelling, and that, after a few days, the characteristic hard, indolent bursatee ulcer breaks out on the part.

The sore usually takes a somewhat circular form, and may vary from half an inch to nearly a foot in diameter. It bears a strong resemblance to a hard chancre. It has a hard, well-defined margin, hard base, and, at first, a dark-red, unhealthy look. When situated on a part covered with muscle, as on the front of the chest, the sore may assume a yellowish white, suppurating appearance, and is kept moist by the exudation of watery fluid. There is but little discharge from the ulcer on the surrounding skin or mucous membrane, as the case may be.

Imbedded in the sore, are found small, hard particles (called *kunkur*) of a yellow or yellowish red appearance, and varying in size from that of a grain of sand, to that of a small pea. They act as foreign bodies in irritating and keeping open the ulcer, and

may be easily removed by the aid of a forceps, or by the finger nail.

" When the kunkur has once grown, unless it is completely burnt out with caustic, fresh deposits of the same kind are found under the skin all round—perhaps owing to some of the diseased matter being carried from the original centre by the absorbents.

" Many of these deposits being no larger than pins' points, it is very difficult to be sure that all are eradicated; and if any remain they will probably increase in size, and cause the sore to burst out afresh during the next hot season. I have seen pieces of kunkur the size of peas picked from the membrane inside the eyelids of colts whose eye fringes, being out of repair, did not keep off flies—an ulcer or sore not having had time to form " (*Meyrick*).

A dried-up bursatee sore, the appearance of which has not been modified by the action of caustics, etc., may be recognised from the fact of its margin and base being hard; from its surface being but thinly covered; from its position; and from its peculiar, though difficult to be described look. It seems ready to break out again at the first unseasonable change in the weather. When it does so, it will probably extend to many times the size it was when dried up.

POST-MORTEM APPEARANCES.—Oliphant, Meyrick, and other observers, state that kunkur is found in the lungs, liver, and other internal organs of a bursatee affected horse. Further evidence is required to settle the question as to the occurrence of kunkur in these organs, independently of the existence of bursatee.

THE PREDISPOSING CAUSES OF BURSATEE appear to be: irritation due to friction and dirt; neglect in the treatment of wounds; and an irritable condition of the skin brought on by digestive derangement, and by climatic influences.

LIABILITY OF CERTAIN PARTS TO BURSATEE.—The special liability of certain parts seems to depend on their comparative exposure to injury and irritation, and on the thinness of the skin which covers them.

According to the Bengal Stud Records, bursatee is not hereditary. The lymphatic glands do not appear to become affected during an attack of bursatee.

MICROSCOPICAL EXAMINATION OF KUNKUR.—Dr. Thin, to whom specimens of kunkur, in the form of " small, hard, reddish pieces of matter," were submitted, " could make but little of them. When a portion was examined in water, it appeared to be quite amorphous; with acetic acid it looked somewhat like a hardened

cell-conglomeration, but the appearances were not sufficiently marked to justify a statement. The masses may be, and probably are, concretions of pus and epidermic cells formed by heat and dryness. No parasites or organisms of any kind could be detected" ("The Veterinary Journal"). The nodules, like those of actinomycosis, probably consist of fibrous tissue. If, as appears almost certain, a special parasite exists, it would be far more likely to be found in the pus, than in the kunkur.

PREVENTIVE MEASURES.—Special care should be devoted to obtaining as pure a supply of water as possible. All scratches, abrasions and cuts should be treated antiseptically (p. 67), as, for instance, with Meyrick's sulphur and oil application (p. 145).

Flies, during the hot weather, being a source of extreme annoyance to horses, as well as being possible carriers of the disease, should be excluded, as much as possible, from the stable by screens, and by keeping the building dark; though without, in any way, impeding the due circulation of air through it. The stalls should be kept scrupulously clean; for the presence of dung and other dirt attracts flies.

During the hot weather in India, the horse should have a plentiful supply of green fodder. His grain should consist of, at least, a third of bran (by weight); and he should get steady and regular exercise. He should, of course, be thoroughly well groomed at least twice a day.

I am strongly opposed to the practice of frequently washing horses; but I cannot say that it induces bursatee.

TREATMENT.—The theory as to the parasitic origin of bursatee indicates, and experience proves, that the proper treatment is to destroy the surface of the sore, so as to produce a healthy wound; and then to carefully protect the part from the action of air and moisture; from friction or injury of any kind; and from irritation due to dirt, flies, etc., lodging on it.

Use, in the first instance, undiluted carbolic acid freely to the ulcer, so as to destroy its surface; and then keep on it a solution of $2\frac{1}{2}$ parts of camphor in 1 part of carbolic acid.

When the wound assumes a healthy look, substitute the carbolic acid and camphor solution, given on p. 69.

As an alternative treatment, in case the foregoing does not effect a speedy cure, I would advise the application of turpentine; a saturated solution of iodoform in eucalyptus oil (say, a drachm to the ounce); eucalyptus oil; powdered iodoform or tannoform; or burnt alum.

Major Meredith, A.V.D., strongly advises that nothing should

be done to a bursatee sore beyond keeping on it a coating of calomel, which should be dusted on as required, until the scab dries up. The wound will then, he says, rapidly heal under the scab.

The horse might get, with benefit, linseed daily with his food, and an ounce of liquor arsenicalis, which may be given for a week at a time, with intervals of seven days. If the skin be in an irritable state, give 2 oz. of bicarbonate of soda mixed in the food every day. The administration of linseed, arsenic, and bicarbonate of soda has a good effect on the condition of the skin.

From the experience I have had, since leaving India, of the good effect of iodide of potassium in the treatment of actinomycosis (p. 127) and scirrhous cord, I would strongly advise its trial (say, 1 oz. daily in the drinking water) in cases of bursatee.

As bursatee sores heal quickly when the horse is sent up to "the hills," I would advise this to be done in the case of a valuable horse which is thus affected, and even as a preventive measure, when such an animal has suffered from a previous attack.

Strict sanitary conditions should be observed, and good grooming practised.

LEGAL ASPECT OF BURSATEE.—The presence of bursatee, whether the sores are open or dried up, is an unsoundness; because the disease diminishes the animal's soundness, and is always liable to recur.

CHAPTER IX.

NON-PARASITIC SKIN DISEASES.

SIMPLE ECZEMA—ITCHY TAIL—CRACKED HEELS AND GREASE—MUD FEVER—SURFEIT—SCALY ECZEMA—WARTS AND NÆVI—HIDEBOUND—LEUCODERMA.

Simple Eczema.

WE may define eczema as a non-contagious inflammation of the skin which is accompanied by an eruption of pimples that become filled with a watery fluid (serum), which may escape or dry up, and which leaves scabs or scales on the skin. In the event of infection from putrefactive germs, pus (matter), instead of serum, may be formed. The vesicles may be scattered, or collected into groups of various forms. This disease appears to be brought on by some influence which interferes with the healthy action of the skin, such as checked perspiration; errors in feeding; irritation from the wearing of woollen or dirty clothing, or from dirt being allowed to accumulate on the skin; want of grooming; a "heated" state of the system; or by infection. In some cases, its cause seems to be constitutional; in others, local. "It is probable, though the disease is not parasitic in the first instance, that secondary infection may play a very important part in its development" (*Whitla*). The root of the tail (p. 152) is often the chief point of attack. The eruptions may extend over any part of the body; the most common spots being the neck, shoulders, flanks, insides of thighs, and root of tail. The scattered form of eczema (*lichen simplex*) is very common during the hot weather and rains in India; the tail and the parts about it being, then, its favourite seats. We find a somewhat similar affection, called "prickly heat," among persons residing in the tropics, especially when the climate is a damp one; for the presence of moisture in heated air prevents the free evaporation of perspiration from the

skin, and also encourages the growth of low forms of parasitic life. Recent researches seem to indicate that eczema is generally due to the presence of bacteria.

The irritating effect of a flannel shirt next the skin during the hot weather in the tropics, makes itself quickly felt by the wearer, if he has a tendency to "prickly heat." In fact, the simple wearing of cotton next the skin will often prevent an attack of this affection, which would be inevitable were flannel worn instead. As the skin of the horse is much more sensitive than our own; it is highly advisable in cases of skin diseases which are accompanied by itching, never to put woollen material next the horse's skin. If the use of a rug be necessary in such instances, a clean cotton sheet should be placed under it.

Owing to the similarity of the causes which affect the skins of horses, at the same season, from year to year; we often find attacks of eczema occurring once every twelve months in different animals at the same time, that being almost always summer. If the disease appears in winter, it may then be due to irritation caused by dirty woollen clothing, want of grooming, or some constitutional disturbance which has checked perspiration.

The term *herpes* is applied to an attack of eczema when the eruption of vesicles (small blisters) breaks out on the skin in groups. This form of eczema is sometimes called non-contagious ringworm, on account of its appearing in patches; although the itching and more or less severe eruption on the skin of a horse attacked with herpes, are absent in cases of ordinary ringworm.

The term *prurigo* is frequently used to signify any form of eczema (especially that about the root of the tail) which is accompanied by much itching. "It is uncertain whether there is any specific affection to which the name, prurigo, is applicable" (*Bristowe*). The kindred term, *pruritis*, simply means "itching."

TREATMENT.—Give bran mashes, and mix in them Epsom salts to the amount of 4 oz. daily. If the animal is in a stable, keep him on grass, carrots or other green food. If he is on grass, substitute hay for it.

Boil a couple of pounds of linseed in a gallon of water for five or six hours, and divide it between the daily feeds; or mix a couple of ounces of linseed oil in the horse's food two or three times a day; and in his corn or mash give a drachm and a half of tartar emetic, daily for a week or ten days. The use of common or rock salt should not be neglected. This treatment will generally suffice for mild cases. In more obstinate attacks, stop, after a week's time, the tartar emetic, and substitute an ounce of liquor arsenicalis. After a few days' intermission, these medicines may be alternated

again. If the patient is suffering from indigestion, he should be specially treated for it.

While the ailment lasts, a soft rubber should be substituted for the brush and currycomb.

Wash the horse with warm water and carbolic or tar soap; dry him well; and then dress the irritated surfaces with any of the following:—

(1)	Creolin or Jeyes' Fluid	1 oz.
	Water	1 quart.
(2)	Carbolic acid	1 part.
	Glycerine or oil	40 parts.
(3)	Liquor plumbi subacetatis	1 part.
	Glycerine or oil	4 parts.
(4)	Corrosive sublimate	20 grains.
	Prussic acid (Scheele's strength) ...	2 drachms.
	Liquor potassæ	2 drachms.
	Water	1 pint.
(5)	Dilute nitrate of mercury ointment.	

The last-mentioned agent should neither be used over large surfaces, nor often repeated, for it might salivate the animal.

In the eczema of hot climates, I have often had good results from the application of salicylic acid and lard (1 to 8).

For human practice, Whitla ("Dictionary of Treatment") strongly recommends an ointment composed of the following ingredients:—

Liquor carbonis detergens	1 drachm.
(Alcoholic solution of coal tar)	
Chloride of mercuric ammonium	10 grains.
(White precipitate)	
Lanoline	1 oz.

It might be tried with advantage in horse cases.

Itchy Tail (*Eczema of the Tail*).

The unscientific term, itchy tail, is used for convenience sake to express an irritable condition of the dock which induces the horse to rub it against any convenient object and thus disfigure himself. The animal is usually prompted to do this by skin disease of the part, by the fact of the end of the tail being sore from having been docked, or by reflex irritation, such as that due to worms. The presence of dirt is a frequent cause of this condition, and also of itchiness of the mane.

TREATMENT.—To protect the part from being rubbed, we may use a regular tail cover or tail guard, which is connected by a strap

to the roller (surcingle). If we cannot procure one of these appliances, we may roll round the root of the tail a cotton bandage, about 4 yards long and 3 inches broad, which can be kept in its place, if we, from time to time, take up a lock of hair of the tail from below, and turn it upwards, so that at the next turn of the bandage, the reversed lock of hair may come between two thicknesses of cloth. This bandage can be secured by tapes, by sewing, or by a safety pin. The presence of the tail cover or bandage not only saves the part from injury; but also has the effect of inducing the animal to refrain from rubbing it.

An admirable remedy for itchy tail, when this condition is due to an inflamed state of the skin, is to put, say, a wineglassful of paraffin (kerosene oil) and a pint of water in a bottle, and, after shaking up the contents of the bottle, slowly pour the fluid over the rubbed parts with one hand, while working the fluid into the hair with the fingers of the other hand. One application (which may be repeated) is generally sufficient to stay the irritation. I am of course aware that this mineral oil does not mix with water, the presence of which is necessary in this case, to allow only a very small amount of the oil to remain on the part, which it would be apt to blister if it was left on it in any considerable quantity. If the mode of this application be not scientific, it is, as a rule, very effective. As an alternative method of applying this oil, we might soak the tail well with water; rub about half a wineglassful of the oil into the affected parts; and then pour water freely over them. After this treatment, the use of a tail cover or bandage will rarely be necessary.

In our own cases, rubbing the hands with paraffin oil, washing them with plain water, and then drying them with a towel, is a very effective means for alleviating a rough or chapped condition of the hands.

Instead of applying mineral oil, we may wash the part well with warm water; rub in a plentiful supply of carbolic soft soap, or soft soap in which creolin (one ounce to the pound) has been mixed; and put on a tail cover or bandage, which we may remove next day. The part should then be washed with warm water, which will make a good lather with the soap that has been previously put on, and we may apply any of the applications given on page 152. This treatment may be continued for a few days. The constitutional treatment would be similar to that described for simple eczema (p. 151).

When the irritation is due to docking or to worms, the case should be treated in the manner respectively described in the chapters on wounds and internal parasites.

Cracked Heels and Grease *(Eczema of the Pasterns).*

DEFINITION.—Cracked heels and grease are terms used to denote an inflamed condition of the skin at the back of the pastern produced by irritation to the part; mild cases being called "cracked heels"; bad ones, "grease" (pustular eczema). The large warty growths which sometimes accompany grease are termed "grapes." Cracked heels are similar to the chapped condition of the hands which often affects persons in cold weather, and which is greatly favoured by wetting the hands. The term "scratches," which was the old English name for cracked heels, is still used in America.

CAUSES.—Although constitutional causes may predispose to an attack, I do not think they can, of themselves, induce one; for were it so, the inflammation would not be confined within its usual very narrow limits. Möller considers that there is a close connection between grease and canker, and that one may develop into the other. Experience amply proves that ordinary cracked heels can be caused by local irritation. If, therefore, we accept (which I am inclined to do) Möller's theory, we must regard, as two distinct diseases, cracked heels and grease; and that the former cannot become developed into the latter, without the presence of a special infective material, which, I need hardly say, would have easy access to skin that had already existing cracks and sores. As, however, I am unable to draw a sharp line of demarcation between the respective symptoms of cracked heels and grease; I shall describe them under one heading.

The true skin is covered by a protecting layer of scarf-skin (the *epidermis* or cuticle), which is similar in its nature to horn and hair, and is composed of scales of *epithelium*. The hard corns which come on the hands from rowing and other kinds of work, and which may be cut off without causing any pain, are thickened portions of the epidermis. The rolls of apparent dirt which a shampooer in a Turkish bath removes from the skin of the person upon whom he operates, are for the most part (according to the degree of cleanliness of the subject), layers of epithelium.

The epidermis being unprovided with nerves and blood-vessels is unable of itself to set up any inflammatory action, its duty being to protect the true skin, which forms it. In order to render it the better able to perform this work, it is kept, during health, more or less moist with oil which is poured out from the ducts of the oil glands that are imbedded in the true skin. The more any particular part of the skin is subject to become bent or thrown into folds, the more plentifully is it supplied with these oil glands. As the true skin is very sensitive to the action of any external irritant; it follows that causes which tend to weaken the protective action of the epidermis, may give rise to inflammation of the true skin, of which eczema is one form. There seems but little doubt that the ammonia which is to be plentifully found in ill-kept stables, is a fruitful cause of cracked heels and grease. The action of water on the skin renders the scarf-skin soft and pulpy,

diminishes its strength by separating the layers which compose it, one from another, and deprives it of the oil which renders it soft and pliable. When the epithelium dries after having been thus treated, it is liable to crack, and thus to expose the true skin to irritation from dirt and grit, and from impurities contained in the surrounding air or in the water which may gain access to the part. The action of water in weakening the protective influence of the epidermis by dissolving out the oil previously contained in it, is well shown by the fact that washing a horse's feet with warm water is much more liable to give cracked heels than washing them with cold water; the former being the better means of the two for removing the oil, and for softening the epithelium. Besides, if the water of a country contains much mineral matter (such as salts of lime) which has a tendency to increase the power water possesses to remove oil from the skin, we shall find that horses in such a district are peculiarly liable to cracked heels. Water containing such mineral matter would, with a weakened epidermis, probably have a directly irritating effect on the true skin. The foregoing remarks have been made with special reference to cracked heels. The rôle of infection in the production of grease is, as I have already indicated, an open question.

The moisture and accumulated filth, as well as the ammonia to be found in unsanitary stables, play a large part in the production of cracked heels and grease. Dew taken up by the feet from the ground over which animals travel, and sweat running down and drying on the pasterns, especially if there be a cold wind blowing at the time, often cause cracked heels in horses which are subject to these influences, as we may see in the cases of race horses that are worked in the early mornings. Other things being equal, horses which do their work at fast paces, are more likely to get their heels chapped, than are those whose work is slow; for the skin that covers their pasterns is subject to more violent and rapid flexion and extension than that of slow going animals, and will proportionately suffer from any derangement of the lubricating apparatus, which, here, is the oil glands of the skin. The feeding of horses on unwholesome oats appears to have a predisposing influence in the production of cracked heels.

As a rule, white pasterns are more liable to suffer from cracked heels, especially among "pleasure horses," than dark-coloured ones; because dirt and stains show more prominently on them, and consequently they get oftener washed, and have soap and other alkaline preparations more frequently applied to them. Grease is much more common among Shires, than among light horses. Experience tells us that cold has a well-marked effect in producing this disease. We knew from experiment that if blood, after having been expelled from the blood-vessels and kept out of them for some time, be allowed to return to the vessels, it will act as an irritant to their walls, and will set up inflammation. This appears to be the mode in which cold produces inflammation of the skin of the pastern; for it renders the part bloodless for the time being.

Want of exercise, no doubt, has a strong predisposing influence

on this disease; for when the animal is kept in a state of enforced rest, the blood in his feet and lower portion of his legs is liable to, more or less, stagnate, on account of the habit the horse usually has of standing up. While this partial congestion exists, the health and vitality of the living structures involved in it, become more or less impaired, and the secretion of oil to lubricate the cuticle (outer skin) becomes proportionately reduced. High feeding, will also predispose the animal to inflammatory attacks of the skin, as well as of other parts.

Hand-rubbing the pasterns of stabled horses, by stimulating the local circulation, reduces the liability of the part to contract eczema; though it would probably be of no benefit to horses kept in the open. It is evident, however, that if the skin of the pasterns has become accustomed to it, and its practice is suddenly discontinued, the skin, before it regains its usual working efficiency, will be more subject to this form of inflammation, than it would be, had such stimulation never been applied.

As the hair at the back of the pastern forms a protection to the part, its removal often induces cracked heels and predisposes the animal to grease. It is probable that old horses, from their lower vitality, are more susceptible to eczema of the pastern than are young ones.

Injury, such as that caused by hobbles or ropes, sometimes gives rise to cracked heels; because it exposes the true skin to influences that are likely to give rise to this complaint.

The great predisposing cause of cracked heels is the senseless practice of washing the feet, which is popular among grooms; because it saves trouble for the time being. It is a significant fact that cracked heels are as rare among horses whose legs and feet are never washed, as they are common among animals whose legs and feet enjoy the supposed benefit of being cleansed with water, no matter how carefully they may be afterwards dried.

VARIETIES.—The degrees of severity in this disease are (1) when it is characterised only by redness and a little heat and swelling (erythematous eczema); (2) when vesicles form (vesicular eczema); (3) when there is a discharge of pus from the skin (pustular eczema); and (4) when there are "grapes" or warty excrescences on the skin (warty eczema), which are accompanied by more or less infiltration of the skin. We may roughly class (1) and (2) as cracked heels; and (3) and (4) as grease.

SYMPTOMS.—When inflammation is set up in the part, the secretion of oil is interfered with, and cracks usually occur in the places where the skin becomes wrinkled when the pastern joints

are bent. The discharge from the vesicles or pustules has an offensive smell, and exerts an irritating effect on the skin, which becomes thickened, according to the degree of inflammation. If the disease continues for some time, the part becomes denuded of hair, and the cracks in the skin become filled up with hard fibrous tissue, which in severe cases stands out in the form of thick ridges. These fibrous tumours are due to an excessive growth of scar tissue, which is the material that unites the edges of wounds that heal by granulation, and which gives the white appearance to an old scar. In the characteristic form of grease, the discharge is thin, foul smelling, and greasy; hence the name. In grapes, the papillæ of the skin are affected; and warts, which may in extreme cases be as large as a man's fist, appear on the surface. In the early stages of a sharp attack, there is pain and lameness, which usually disappears as the disease becomes chronic. If there be no discharge of fluid, the surface of the part will be covered with horny cells, which will have a mealy appearance. Cracked heels and especially grease have a marked tendency to run a chronic course.

PREVENTIVE TREATMENT.—Do not wash the legs and feet. If they be muddy when the horse returns to his stable, let the mud dry on, and when it is quite dry, brush it off. A brush, slightly damped cotton cloth, and pricker, is all that is required to keep the wall of the hoof, sole and frog clean. If it be imperative to wash, carefully dry after doing so, and rub in some suitable lubricant, such as lanoline, sweet oil or fat (a little beeswax might be a useful addition in warm climates to increase the consistency), which should also be applied before the horse leaves the stable. Under ordinary circumstances, as in racing, hunting, and private stables, not more than one horse in twenty, during the year, ought to get cracked heels, which, as a rule, is caused by gross mismanagement on the part of the groom. The occurrence of grease is unknown in well-managed stables. Horses in loose boxes should not be tied up during the day.

PRINCIPLES OF TREATMENT.—If acute inflammation be present, reduce it, and then use some application which will lubricate the part without irritating it. If there be a discharge, disinfect the part before using the oily application. Remove all warts and tumours with the knife or scissors, and treat the wounds antiseptically (p. 67 *et seq.*). Give the part rest.

TREATMENT.—I have seen so many cases of cracked heels having been rendered chronic by the persistent use of supposed remedies which did harm instead of good, that I would advise the

employment of no stimulating applications in the first instance; and would content myself with washing the part twice a day with warm water and a soft nail brush into which some bland toilet soap had been rubbed. I would try to gently remove the thickened scar tissue which fills up the cracks, by means of the finger nails after it had been well softened by warm water and soap. Having thus disinfected the part and cleared away the exfoliating surface skin, I would dry it with a soft towel, and rub into it some non-irritating oily matter, such as lanoline, fresh animal fat, sweet oil, or fresh butter. Even a very small quantity of salt in either the fat or the butter, will cause either of these substances to have an irritating effect on the skin. If there be much heat and soreness present, we may apply, after the washing, a carrot or turnip poultice for a day or two. Having taken off the poultice, we should wash the part, gently scrape off the thickened cuticle and fibrous tissue, and apply the lubricant. Dr. Armstrong, Indian Medical Service, informs me that he has found very good results from enveloping the part in hot, dry bran. When the skin gradually begins to assume its normal condition, we should by degrees dincontinue the washing and the lubricating application. If the simple oil, or fat, be found ineffective, we may substitute for it, oxide of zinc ointment (1 to 8 of lard), nitrate of mercury ointment (1 to 4 of lard), or liquor plumbi subacetatis (Goulard's extract) and oil or cream (1 to 4). If the legs be filled, apply pressure in the manner described on page 45 and hand rub, so as to quicken the circulation of blood. A return to a state of health will be shown by the part re-assuming its usual covering of fine hair.

For grease, Gerlach advises creosote and spirit (1 to 6), or we might use carbolic acid 1 part, camphor $2\frac{1}{2}$ parts; or creolin, 1 to 6 of water. Möller strongly recommends Lies's treatment with sulphuric acid and spirit (about 1 to 15). If grapes or scar tissue tumours be present, carefully disinfect the part (a good wash is 20 grains of chinosol or $\frac{1}{2}$ oz. of creolin, in a pint of water); remove the excrescences with the scissors, or knife; apply tannoform, or some other suitable antiseptic (p. 67) to the wound; cover over with antiseptic cotton wool and gutta-percha tissue; and apply a bandage, with evenly distributed pressure (p. 45), so that the wound may heal in the best and quickest manner. Following the lines of success in the treatment of canker (which, I have already said, is closely akin to grease), we may in that of grease, strenuously try to obtain a dry condition of the affected skin, by one or other of the applications just mentioned, by evenly distributed pressure, and by Armstrong's dry, hot bran poultice.

Professor Fröhner has had admirable results in the treatment of grease, grapes, mallenders and sallenders, by painting the affected

parts with a solution of chromic acid (1 part to 9 parts of water) every day, or every second day, until they dried up.

For treatment by carbide of calcium, see page 174.

Veterinary Surgeon Desmond tells me that he has often cured most obstinate cases of cracked heels by simply tying the horse up short in a narrow stall, so as to prevent him lying down or moving about—feeding him lightly, and using no application to the pasterns. The repair of the cracks would be hastened by using cotton wadding bandages, which would help the circulation of blood in the animal's limbs. Long-continued standing naturally produces more or less stagnation of blood in the legs. Slings (p. 680) might be tried with benefit.

Mud Fever *(Eczema of the Legs and Abdomen)*

is an ailment similar to cracked heels; being inflammation of the skin of the legs, which sometimes extends to the belly, and is caused by the action of moisture and mud, and particularly by the practice of washing the legs after continued work through wet and dirt, as when hunting. There is usually present a certain amount of fever, brought on by irritation to the skin. The limbs become very sore, and the horse has to be thrown by for some time.

Here, as in cracked heels, owing to the presence of inflammation, the oil glands of the affected skin do not pour out a sufficiency of oil to keep it in a soft and pliable condition.

The practice of clipping horses' legs is a strong predisposing cause of mud fever, as well as of cracked heels. If a horse which is exposed to influences that are likely to cause mud fever and cracked heels, has to be clipped, it is well to confine the use of the machine and scissors to the head, neck and body, and to leave the legs untouched. If, after work through mud and wet—supposing the animal's legs have neither been clipped nor singed—the legs be not washed, but be allowed to dry of their own accord, they will rarely become affected by mud fever. The use of warm water, as I have remarked in the case of cracked heels, even with every precaution, is very liable to cause this affection.

If the legs of a sound horse have to be washed, use only cold water; do the washing in a stable out of the wind; quickly and thoroughly dry the legs with the rubber and by hand-rubbing; apply lanoline, fresh fat, or sweet oil; and put on flannel bandages. I would advise, as a matter of ordinary stable routine, that the external use of water should be confined to the animal's muzzle, eyes, dock, and sheath.

TREATMENT.—Treat as for cracked heels. If fever be present, give a mild dose of Epsom salts.

The best preventive measures are to allow the mud and dirt to remain on the legs until they are thoroughly dry—say, till next morning—and then brush the dust off; and to refrain from washing or clipping the legs.

Surfeit *(Urticaria or Nettle-rash)*

is the term applied to an eruption of small irregular lumps or boils which are more or less painful to the touch, and which break out suddenly, as a rule, on the horse's body and neck, and in rare cases on his limbs. A favourite seat of this eruption in saddle-horses is the bearing surface of the saddle on the upper part of the back, and especially under the cantle; probably because there is more motion at the cantle than at the pommel, on account of the forward position of the girths. Sometimes, after two or three days, the lumps form scabs, which usually fall off during the course of a week, and leave behind a hairless and more or less round patch of skin, of, say, a quarter of an inch in diameter. These spots generally remain as permanent marks on the coat. If the inflammation has been sufficiently severe to destroy, in a dark-skinned horse, the layer of pigment in the skin of the part, the spots will be white, with, usually, white hairs in them. The destruction of a portion of the pigmentary layer need not necessarily involve that of the contained hair follicles. On a grey or white horse which has a dark skin, a slight attack of surfeit may leave a number of black spots showing through the light-coloured coat. The presence of these painful lumps on the back of a saddle-horse may become known to the rider by the fact of the animal acting, when he is being mounted, as if he had a sore back.

The usual cause of surfeit is supposed to be the consumption of food which upsets the animal's digestive organs; for the skin being continuous with the mucous membrane of the intestinal canal, a disturbance of the one structure is readily communicated to the other. Apparently owing to the extremely dry nature of the forage during the greater part of the year in South Africa; the horses of that part of the world frequently suffer from surfeit. In men, "the formation of wheals is the special characteristic of urticaria" (*Bristowe*). From a consideration of the nature of the attack and course of the disease, I cannot help thinking that surfeit is often of parasitic origin.

TREATMENT.—Usually, I have had good results from smearing over the lumps and sores with mercurial (blue) ointment. Sometimes, putting the affected horse on carrots or green food and giving

him 4 oz. of Epsom salts a day in a mash, will be sufficient. We may also give a linseed mash every night, and mix in it an ounce of bicarbonate of soda, and may apply (4) or (5), as mentioned on page 152. The bicarbonate of soda has a soothing effect on the mucous membrane of the intestines; and the good influence of linseed, in cases of irritation of the skin or mucous membrane, is well marked. In obstinate cases, employ tartar emetic, or liquor arsenicalis as directed on p. 151.

Scaly Eczema *(Pityriasis and Psoriasis).*

There is no essential difference between simple eczema and scaly eczema, except that the latter is an advanced and more or less chronic stage of the former. The adoption of this broad and thoroughly sound view should do much to clear up the confusion which exists concerning various forms assumed by non-contagious skin inflammation. The old popular terms, "humid tetter" and "dry tetter" may be taken to respectively designate the moist and scaly forms of eczema. As the word, *psoriasis*, means mange; it is inapplicable to a non-contagious disease. *Pityriasis*, signifying a bran-like condition, is a suitable expression for a scaly inflammation of the skin. "Queensland Itch," which is often met with among horses in Eastern Australia, comes under this heading. In India, eczema which takes the same form, is common during the hot weather and "rains;" and frequently invades the dock and space between the thighs.

The scaly stage of eczema is often accompanied by cracks in the affected skin on account of the existing inflammation having interfered with the action of the oil glands, the function of which is to keep the skin soft and pliable. The inflammation, also, causes thickening of the part. In bad cases, the cracks exude serum and blood, which aid in the formation of scabs. When it appears behind the knees, it is termed "mallenders;" when in front of the hocks, "sallenders." It also occurs on the neck, just in front of the withers; on the upper surface of the root of the tail; and, more rarely, in other positions, in which cases the eruption receives no distinctive name. Mallenders and sallenders are not very amenable to treatment, and rarely occur except among horses whose stable management has been much neglected.

TREATMENT in ordinary cases is the same as that of simple eczema (p. 151). When the skin becomes fissured or very rough, it is well to soak the affected part in oil to remove the scales, and after that to use dilute nitrate of mercury ointment. Or, after washing the part, we might rub in Jonathan Hutchinson's oint-

ment, which is made as follows:—Chrysophanic acid, 20 grains; Wright's liquor carbonis deterg., 20 minims; white precipitate (hydr. amm. chlor.), 20 grains; benzoated lard, 2 oz. The part should neither be fomented nor poulticed. The horse may have linseed mashes or oil, given to him daily, as well as carrots or green fodder. Beans and kiln-dried or musty oats should be avoided. Two ounces of bicarbonate of soda and an ounce of liquor arsenicalis may be mixed through the food or water daily. A drachm and a half of tartar emetic may be substituted for the arsenic, which should not be continued for longer than a week at a time; as it is liable to accumulate in the system.

Warts and Nævi

consist in excessive growth, by the implicated papillæ of the skin, of epithelium (p. 154) in the form of excrescences. This defective state of the skin is due to impaired vitality of the part, and is often caused by neglect of cleanliness. Warts are generally found on the lower part of the belly, on the lips, nostrils and eyelids, and about the sheath and penis of the horse, or udder of the mare.

The appearance and position of a wart will sufficiently indicate the proper means for its removal, whether by caustics; the knife; the scissors; tying it with silk, thread or horsehair; or by the firing-iron. The hot iron may be often used with advantage, after the wart has been cut off. On parts requiring delicate treatment, such as the eyelids or lips, the daily and careful application of strong glacial acetic acid may be tried; or a saturated solution of washing soda in water, four or five times a day, for a few days. A saturated solution of caustic potash, carefully put on, is an admirable wart solvent. The application of fresh blood has often been recommended. Arsenic (5 grains daily in the food for a week) has sometimes a good effect in the removal of these excrescences.

A *nævus* is a tumour formed by a new growth of blood-vessels. In man, "birth-marks," or "port-wine stains," are familiar forms of it. The only kind of nævus which I have observed in horses is the superficial variety that is often found under the belly. Nævi somewhat resemble warts in appearance, except that they have a broader base, and are much more inclined to bleed from injury. They can be treated in the same manner as warts.

Hidebound

is a symptom of ill-health, and is not in itself a disease. The skin is dry and hard, and appears to be drawn tightly over the animal's body, so that it is difficult to pinch it up with the fingers anywhere over the ribs. This condition is generally brought on by indiges-

tion, derangement of the liver, or worms. It also accompanies, or even precedes, many serious illnesses.

TREATMENT.—The only rational line of treatment to adopt is to endeavour to remove the cause, whatever that may be.

Leucoderma

is an abnormal white condition of skin which occurs in patches on various parts of the body. It seems to be confined to the thin

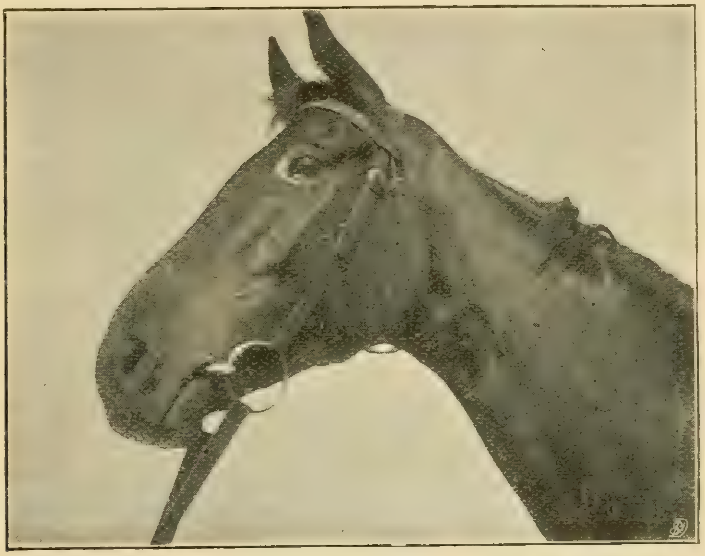


Fig. 47.—Leucoderma round the near eye.

skin of the face (especially about the nostrils and round the eyes, see Fig. 47), under surface of the tail, and parts between the hind legs, from the anus to the sheath or udder. In man, it is sometimes erroneously called leprosy. The patches are liable to increase or decrease in size, without any apparent cause. It is a deficiency of pigment in the skin, and though an eyesore, it has no ill effect on the health of the affected part. Its cause is unknown, and its treatment, up to the present, has been of no avail.

CHAPTER X.

Diseases and Injuries of the Feet.

THRUSH—CONTRACTED HEELS—CANKER—SANDCRACK—FALSE-QUARTER—SPLIT-HOOF—ACUTE LAMINITIS—CHRONIC LAMINITIS—SEEDY TOE—PUMICED FEET—BRITTLE FEET—INFLAMMATION OF THE CORONET, OR VILLITIS—NAVICULAR DISEASE—HORN TUMOUR—WOUNDS AND BRUISES OF THE CORONET—PRICKS IN SHOEING—WOUNDS OF THE SOLE AND FROG—CORNS—QUITTOR—FORGING OR CLICKING.

Thrush

is an inflamed condition of the membrane which secretes the horn of the frog. During the presence of inflammation, this membrane forms weak and degraded horn of cheese-like consistence, which readily liquefies under the action of moisture, and produces the characteristic offensive discharge. The longitudinal fissure which exists in the centre of the thick portion of the frog of a foot suffering from thrush (Fig. 48) is caused by the failure of the secreting membrane to produce sound horn. In a healthy foot, the "cleft of the frog" is merely a depression (Fig. 49) in the frog substance, and does not penetrate to the sensitive parts. The two great causes of thrush are want of pressure on the frog, and the decomposing effect which moisture that is laden with fermenting organic matter, has on the frog. The former cause is greatly aided by the pernicious practices of paring the frog, and using high-heeled shoes; and the latter, by the retention of dung and urine in the stall or box, and neglect of frequently picking out the feet of the horses, while in the stable. In India, where the ground is hard, many horses with naturally high heels are very prone to thrush from want of pressure on the frog. Their heels, if not kept sufficiently low, are apt to "wire in," in which case the frog becomes dry and shrivelled up. As the disease advances, fissures, from which a stinking odour issues, occur on the sides of the frog, close to the heel, and the foot acquires a contracted appearance (Fig.

48). In the event of a horse under these abnormal conditions falling lame, an ignorant or careless observer may, not unlikely, assume the ailment to be navicular disease. When thrush is caused by wet, the frog becomes soft and pulpy. In the absence of moisture acting on the feet, there may be little or no discharge from the cleft of the frog, which will be then more or less filled with soft, degraded horn of, as I have already said, a cheese-like consistence. In this case, the frog will be more or less shrivelled

Fig. 48.—Foot with contracted heels and thrush.

up. The presence of the disease is always accompanied by an offensive and peculiar smell.

Pressure on the frog causes an increased growth of epithelium (p. 154). Hence, when the frog is exposed to continual pressure, it becomes strong and well developed; but, if it be deprived of this natural stimulus, it becomes diseased and contracted in size. The skin of our own hands and feet is as dependent on continued pressure for its strength and hardness, as is the frog of the horse.

Horses which are worked (as in riding schools), or stabled, on tan, are very liable to get thrush on account of the tan becoming

balled in the feet, thereby causing the frog and sole to become heated by stopping evaporation of moisture from them. The ill effects of the tan, in this case, can be entirely obviated by frequently picking out the feet, so as to prevent the tan becoming caked in them. The same remarks apply, more or less accurately, to the use of moss litter and sawdust.

Thrush is more frequently found in the hind than in the fore feet; (1) because, in badly-managed stables, the dung and urine of horses are often allowed to accumulate under the hind feet for a considerable time; and (2) because the hind feet being naturally more upright and concave than the fore feet, their frogs are less exposed to pressure.

In England, thrush much more commonly affects the off feet than the near ones, on account of the idiotic custom, among English grooms, of attending to the feet only from the near side.

Thrush is, I think, never induced solely by constitutional causes. To prove such a case, it would be necessary to show that the affected foot had been kept dry, in the stable, and that the frog had been subjected to pressure for a considerable time before the attack. Under these conditions I have never known of an instance of thrush.

In the tropics, maggots are sometimes found within the cleft of a frog which suffers from thrush. Their presence, as might be expected, greatly aggravates the disease.

In neglected cases, the horny covering of the frog may rot off, and the red and bleeding sensitive parts become exposed.

TREATMENT.—If there be no lameness, keep the feet dry, and avoid "stoppings." Carefully remove with the drawing knife or searcher (Fig. 50) any diseased or loose portions of horn, in order to prevent dirt or wet accumulating about them. The "drawing knife" is the peculiarly-shaped knife with which a blacksmith pares a horse's foot; and a "searcher" is a fine and narrow-bladed drawing knife. Into all the parts from which either discharge or bad smell issues, introduce one of the following applications:—

(1)	Burnt alum	
(2)	Calomel	
(3)	Formalin	1 part.
	Water	3 parts.
(4)	Paraffin oil	1 part.
	Sweet oil	1 ,,
(5)	Eucalyptus oil	8 parts.
	Iodoform	1 part.
(6)	Oil of turpentine	5 parts.
	Sweet oil	5 ,,
	Iodoform	1 part.
	Camphor, as much as will dissolve.	

If expense be an object, the iodoform may be omitted from the two foregoing preparations.

(7) Common salt, 1 part.
Stockholm tar or tallow, 6 parts.

Fig. 49.—Healthy foot.

I prefer to all other agents burnt alum, small lumps of which I place in the cleft of the frog and ram them down with the back of a hoof-picker. I treat in the same way any cracks there may be in the frog. If the horse has to be kept at work, I fill up

Fig. 50.—Searcher.

the cleft of the frog and cracks with cotton wool or tow, over which I smear Stockholm tar, so as to keep out dirt and wet. The application, whichever one we use, should be renewed every, or every second, day. Above all things, we should obtain pressure on the frog and should keep the feet dry. The application of a little turpentine undiluted or mixed with an equal quantity of sweet oil, dropped into the cleft of the frog, from time to time, is very

effective for hardening the frogs and for stopping thrush. If turpentine be employed, care should be taken that it is not allowed to run on to the pasterns; for if it does so, it may blister their skin.

If the animal be lame from thrush, it is well to syringe out the parts for a few minutes with warm water, two or three times a day, before using the application, which in this case should not be of a tarry nature; and we should keep him on green food.

We should, if practicable, take the shoes off and keep the heels and wall of the hoof as low as possible, short of making the horse go tender, and should exercise him two or three times a day on dry and soft ground, which, by filling up the cavities formed by the sole and frog, will distribute even pressure over these surfaces. If the exercise be given on a smooth and level track, the consequent pressure will fall only on the horny prominences of the ground surface of the foot. A month of this treatment combined with the other remedial details which I have described, will generally restore the frog to a healthy condition and to nearly, if not quite, its natural size.

If maggots be present, those within reach should be picked out. The application of oil of turpentine, or eucalyptus oil, either by itself or combined in the manner I have suggested, or a little powdered camphor will remove any that may be left.

If the sensitive frog, which will look red and tender, becomes exposed, it may be treated with powdered burnt alum, tannoform, or iodoform, and should be protected from dirt and other irritating bodies by cotton wool, or tow. Here, the use of caustics or strong astringents is not required.

For remarks on thrush brought on by frost-bite, see page 116.

In obstinate cases, give an ounce of liquor arsenicalis daily in the food for a week or ten days.

LEGAL ASPECT OF THRUSH.—In Barrett v. Preece (Shrewsbury County Court, see "Veterinarian" for 1858, p. 235), it was decided that the fact of a horse which was warranted sound, having thrush, was a breach of the warranty.

Contracted Heels.

We may have this condition (Fig. 48) from causes which have been described in the preceding article on "Thrush;" from the practice of the animal going on his toe by reason of the existence of pain (as in navicular disease), or infirmity; or from malformation. As far as my experience goes, the only cases to be attributed to deformity are those in which the coronet, at the back of the foot,

is not on the same level on both sides. I have seen, in two or three instances, the coronet over an inch higher up the pastern at one heel than at the other. Although I have not had an opportunity of examining by dissection any such case after death, I feel assured from the appearance of these feet, that one wing of the pedal bone must have been twisted either upwards and inwards, or downwards and inwards, as the case may have been. In the very few instances that have come under my observation, only one side appeared to be affected. Such a condition will, almost to a certainty, give rise to very obstinate thrush, and will render it difficult to afford the foot a level and properly adjusted "bearing," whether the animal be worked barefoot or in shoes. Although the probability of effecting a radical cure in an aggravated case of this kind would be remote, we should endeavour to palliate the condition, as much as possible, by keeping the heels very low, so as to get as much frog pressure as we can (see treatment of "Thrush," page 166); attending to the thrush, if present; and letting the animal go barefoot, or using "tips." If these simple means be of no avail, we may try the effective one of cutting, through the wall of the hoof, a groove from the coronet to the ground surface of the foot, so as to isolate the abnormally turned in portion of the wall which is close to the heels, from the remainder of the hoof. The groove should be made as deep as possible without drawing blood, in a manner similar to that described for sandcrack (pp. 178 and 180), and should be kept filled with beeswax while the foot is growing down.

The appearance of slight contraction, due to the natural form of the foot being narrow, is compatible with health. So long as the contraction does not co-exist with disease, other than thrush, or with any infirmity which prevents the horse from placing his foot "fair" on the ground, or with malformation; the foot can be restored to a healthy and natural state, in a short time, by the means already described.

LEGAL ASPECT.—If contraction of the hoof is liable to produce lameness, it is an unsoundness. See Greenway v. Marshall, 9th Dec., 1845, which case was tried before Chief Baron Pollock.

Canker.

DEFINITION.—Canker is a chronic and apparently an infective inflammation of the membrane which secretes the sole and frog, and which is a continuation of the skin of the pastern. This membrane covers the pedal bone. Canker seems to bear the same relation to thrush, as grease does to cracked heels. Spontaneous recovery from it does not appear to be possible.

SYMPTOMS.—The diseased portion of the membrane which, during health, performs the function of manufacturing sound horn for the sole or frog, secretes at first a degenerate cheese-like material which assumes, later on, the character of a thin, stinking, and nearly colourless discharge; and its surface becomes studded over with pale, fungoid growths. The sole becomes gradually undermined on account of the extension of this diseased action, which, in most cases, commences at the frog, and sometimes extends to the wall of the hoof. It may, however, begin by an inflammatory condition of the skin at the back and lower part of the pastern, *i.e.*, from grease. The progress of canker is generally very slow. A noticeable characteristic of canker is the comparative painlessness of the disease.

CHANCES OF RECOVERY.—Möller points out that cases of canker are serious, proportionately to (1) the rapidity of their course; (2) thinness of the discharge; (3) implication of the sensitive laminæ; and (4) number of feet affected. Although canker is a tedious disease to treat and demands skill and great patience, it is, even in bad cases, generally susceptible to cure.

PREDISPOSING INFLUENCES.—The tendency of a horse's feet to contract canker appears to be proportionate solely to the amount of their exposure to the action of wet, dirt, general neglect and injury. The hind feet are more often involved than the fore, seemingly because they suffer more frequently from unsanitary influences. I do not think that its occurrence is in any way influenced by breed, conformation, or general health. The fact that it is seen much more in common cart horses than in well bred animals, may be accounted for by the former being more exposed to its predisposing influences than the latter. Modern improvements in stable sanitation have been followed by a well-marked decrease in the frequency of canker.

NATURE AND PRINCIPLES OF TREATMENT.—The fact that although purely local treatment can in almost all cases effect a cure, constitutional treatment is powerless to arrest its progress, proves that it is a local and not, as averred by some authorities, a constitutional disease. Two special characteristics of the inflammation of canker are the infectious influence of its discharge on neighbouring parts of the membrane, and the fact that a diseased spot can be cured only by the removal or destruction of the involved tissue, or by rendering it thoroughly free from putrefaction, which we may do by the use of antiseptics. The consideration of these characteristics suggests the parasitic nature of the disease,

which is a question that has not yet been settled. Thrush, differing from canker, can often be cured by merely keeping the frog dry, and by putting pressure on it by lowering the wall, especially at the heels. Similarly, ordinary cracked heels may be cured by attention to healthy conditions; although recovery from grease is seldom, if ever, possible, without special treatment. The peculiar liability of the frog to become the first point of attack of canker, appears to be due to its giving, particularly when it is affected by thrush, less protection to the invaded membrane than the sole would afford. Also, the influences (such as wet and dirt) which predispose to canker, are the very ones which are mainly concerned in the production of thrush. Injury would naturally be liable to expose the secreting membrane to infection or irritation. In cases of thrush, the secreting membrane of the frog is exposed to external infection, injury, or irritation, through the opening in the cleft of the frog, which, in health, is merely a shallow depression in the frog. Canker may be seen without the fissured condition of the cleft of the frog which is a characteristic of thrush. From the foregoing facts, I think it most improbable that thrush, however much neglected or aggravated, could, of itself, set up canker; although, as we have seen, it is a strong predisposing cause. In some cases, canker appears to be due to the extension of the inflammation of "greasy" heels, on account of the membrane which is the seat of canker, being continuous with the skin of the pastern. Correct treatment evidently consists in the removal or destruction of all involved tissue; in the application of antiseptics; in pressure; and in the protection of the exposed surface from further infection, until that duty can be taken by a new growth of healthy horn.

TREATMENT.—Mr. Malcolm, F.R.C.V.S., in reviving the treatment of canker by the use of the hot iron, which has been employed, not very successfully, by Prévost, Hurtel d'Arboval and others, has introduced new modifications that have been attended with excellent results. He advises ("Journal of Comparative Pathology," March, 1891) that after the horse has been cast, the whole of the implicated horn should be removed with the drawing knife, and that the entire diseased secreting surface should be thoroughly cauterised with the hot iron, which is an "aid of immense value in diagnosis. Applied to the thinned horn or the secreting surface, it unmistakably demonstrates the presence or absence of canker. Healthy tissue chars black: cankered tissue, on the contrary, bubbles up white under the hot iron, and presents an appearance not unlike toasted cheese. Although this test is certain for horn thinned to the quick, it is not

to be relied upon with thick horn, the outside of which may be practically healthy and char black, while its underlying surface may be cankered. Having by means of the knife and cautery removed every known particle of disease, the next procedure is to pack the surface of the sole and frog, thus exposed, with a powerful astringent or caustic dressing. A great favourite of mine consists of equal parts of sulphate of copper, iron and zinc, mixed with strong carbolic acid, a very little vaseline being added to give the mass cohesion. The dressing, covered by a pledget of tow, is held in position by a shoe with an iron or leather sole, and the dressing and the tow together should be of sufficient bulk to produce slight pressure on the sole when the nails of the shoe are drawn up. . . . On the second day following, the shoe should be removed and the foot redressed. Commencing at the edge of the sound horn, as the most dependent part of the foot, all new horn, no matter what its condition, must be pared to the quick, especial care being taken to effectually remove any lingering disease. . . . After all disease has been excised, carefully clean the foot with waste, thoroughly protect any raw surface resulting from over-cauterisation by some mild agent, such as a saturated calomel ointment, re-apply an astringent dressing (I would suggest spirits of turpentine with as much iodoform as would dissolve in it) over the whole affected surface, and nail on the shoe. This method of procedure should now be thoroughly carried out daily for a time, and as it is proceeded with, a successful issue soon becomes assured in nearly every case. When, in spite of these efforts, the disease still persists, depend upon it, the fault is with the operator, who has failed to eradicate some centre of infection. Under these circumstances it may be necessary to re-cast the patient, re-pare the foot, and by the aid of eye, knife and cautery endeavour to find the cause, and having found it, which can invariably be done, remove it. The usual treatment will then speedily be successful. As the case proceeds, dressing every other day will soon be sufficient, then twice a week, and finally once a week until completely cured.

"During this healing process, and after the complete eradication of canker, it may be again repeated. No agent seems to have a more beneficial effect than calomel, and for this purpose it is best used in dry powder. Under this dressing any remaining spot of canker is readily detected by the wet condition of the calomel when the shoe is removed next day. In dealing with such a spot, a very good plan, after all apparently diseased tissue has been excised, is to touch the cankered part with solid nitrate of silver, or a feather dipped in one of the strong mineral acids, and then re-apply calomel over the surface. In successful treatment the shoe must be removed each time. An adjustable plate will not do, as no man can

thoroughly pare and examine a foot with the shoe on" (*Malcolm*). Möller, following Pütz, considers the best caustic to be nitrate of lead, which may be applied in powder to the diseased surface. It dries up and checks the growth in a very effective manner. The resulting scab should be examined from day to day, so that if any of the parts underneath it become moist (thereby indicating fresh points of infection), the scab may be picked off and the caustic re-applied.

It is evident that the stricter antiseptic precautions are observed, the better will be the result. After using the drawing knife on the diseased horn, it should, before employing it again on the part, be disinfected (p. 70). Instead of tow as a dressing, we might use antiseptic cotton wool; disinfect the whole of the foot by washing it with strong carbolic soap and afterwards with an antiseptic solution (p. 67); and remove the horse into a fresh stall, so that he may not stand on a contaminated surface.

When using the hot iron, care should be taken not to destroy any part of the secreting membrane; for if that be done, the seat of injury will lose its power to secrete horn, and a troublesome sore, ending with a scar, will be the result. "The cautery should be laid aside as soon as the tissue cauterised ceases to burn white" (*Malcolm*).

Acting on the supposition that canker is a parasitic disease, Nocard has treated cases of it very successfully with a solution of corrosive sublimate (10 grains to the pint of water), which he applied by means of a pulverisator, which is an instrument for forcibly directing a fine jet of fluid on any particular part. Having pared down the foot, removed with the drawing knife the undermined horn, and secured the animal in the stocks, Nocard projects with considerable strength the vapour of the corrosive sublimate solution on the ground surface of the affected foot for two hours and a half. After an interval of a quarter of an hour to allow the parts to become dry, the procedure is finished by repeating the operation for about ten minutes with a saturated solution of iodoform in ether. In one case, a single application of this kind, followed by an ounce of liquor arsenicalis in the food for a week, effected a complete cure.

Veterinary Surgeon Rexilius of the German Army states that he cured a bad case of canker in fourteen days by, after having removed all the disintegrated tissue, pouring creasote over the affected parts twice a day. Following this advice, Mr. F. E. Place, M.R.C.V.S., reports ("Veterinarian," July, 1894) that he has had similar success with two old and severe cases of this disease. He used from 30 to 40 minims of creasote as a dressing twice a day.

In an article of "The Veterinarian," translated from "Recueil

de Médecine Vétérinaire," we read that Mesnard has had admirable results in the treatment of canker with carbide of calcium, which is a product of the electrical furnace and is obtained by fusing carbon and lime together. When it comes in contact with water, it gives off acetylene gas. Mesnard uses a mixture of 320 grains of carbide of calcium and 80 grains, each, of neutral acetate of copper and iodide of starch. "After removing the degenerated horn and *débris* from the parts affected, and having dried the diseased surface and thinned the horn around, the bare patch was swabbed with ether, which cleanses the part and also produces a local anæsthesia. The diseased area was then completely covered by the powder, which was well dusted into the lacunæ of the diseased frog, and kept applied to the parts by iodised cotton wool, and bandaged in the ordinary way. The dressing was changed daily, and any diseased horn removed; but after the dressing had been used for ten days, the parts were quite dry, and covered by a thin pellicle of healthy horn. When the powder is applied to the affected parts, a slight crackling is heard, due to the disengagement of the acetylene, which is at once recognised by its odour." The same treatment has given excellent results with wounds and grease.

Above all things, we should utilise the healthy influence of pressure on the foot, and if possible should dispense with shoes, even if we have to employ slings. The floor of the stall or box should be kept scrupulously dry and clean, and the animal, if practicable, should be well exercised on dry and soft ground, so as to put pressure on his soles and frogs. With the same object, the heels and walls of the feet should be kept low.

Under ordinary methods, cases of canker require several weeks, if not months, of careful treatment.

LEGAL VIEW.—Canker is a grave unsoundness.

Sandcrack

is a vertical crack in the wall of the hoof, occurring, in the first instance, close to the coronet.

CAUSES.—In the healthy foot, the fibres of the wall are firmly held together by adhesive material, which is secreted by the coronet, or, according to some authorities, by the sensitive laminæ, which cover the external surface of the pedal bone. If the secreting membrane be subjected to influences which will impair its healthy working, the material secreted under such conditions will to a certain extent be deprived of its binding character, and the horn which it

supplies will consequently be wanting in strength. In some cases —generally those of hereditary predisposition—the horn is naturally so weak that it would appear liable to split on its being subjected to any violent strain. The horn of the feet of almost all horses which are reared on wet, marshy land is more porous and

Fig. 51.—Bar shoe, designed to give pressure on the frog.

ready to split than is that of those brought up on dry soil. The pernicious system of using seated shoes and of paring the frog, induces sandcrack by the unnatural manner in which the entire weight of the animal is thrown on the crust of the foot, instead of being distributed, as nature intended it to be, between the wall, the frog, the outer portion of the sole, and the bars; irritation

being consequently set up in the secreting membrane from undue concussion. A "seated shoe" is a shoe which affords pressure only to the wall of the hoof, and is made concave on its upper surface, so as to take all pressure off the sole. The effects of fast work on hard ground will aid in inducing the process of perverted secretion. If these influences be kept up for some time, that portion of the hoof, namely, the upper part, which has been secreted under them, will be liable to split, and consequently to form a sandcrack at any moment, which it will naturally do at the point which receives the greatest amount of strain; that being, usually, the inner quarter of the fore, and the toe of the hind foot. It sometimes occurs at the toe of the fore foot, when the hoof is very flat. I have met with cases of sandcrack which were brought on by indigestion, on account of the secreting membrane of the hoof participating in the general derangement set up in the digestive organs. Although the fissure occurs in a moment, the process which induces the weak condition of horn is necessarily a slow one.

As far as I can judge, the horses most liable to sandcrack are cart and cab horses which are worked on hard ground. It appears to me that sandcrack as a rule occurs in two ways: (1) by concussion, which is specially productive of sandcrack in the fore feet; and (2) by undue strain, as in the hind feet of cart horses which have to drag heavy loads, especially when they are shod behind with toe-pieces.

SYMPTOMS.—The injury first begins by a small fissure close to the coronet, and extends upwards, downwards, and inwards, as the mischief is aggravated by concussion, or by strain. At first the crack may be so short and narrow as to escape notice unless closely examined. As long as it is confined to the exterior portion of the wall, there will be no lameness; but if it implicates the entire thickness of the wall, the sensitive, underlying tissues will protrude through the crack, and will get pinched and wounded as it opens and shuts during movement, with the unavoidable result, when work is prolonged, of making the animal lame, especially if the toe of the hind foot is the seat of the injury. A rest may cause the disappearance of the lameness, which will certainly return on the resumption of work under previous conditions. In time, the fissure may extend from the coronet to the ground, and may gape considerably. The exposed sensitive tissues, owing to irritation and putrefactive contamination, may discharge pus, which may or may not be mixed with blood. This discharge may be more or less frothy from the fact of the air which enters the crack, becoming churned up with the discharge as the fissure opens and shuts at each step.

Peuch and Toussaint assert that if the injury is at the toe, the crack opens when the foot is raised from the ground, and closes when weight is put on it; but that these actions are reversed when it is at the quarter. Their view seems to be borne out by the fact that the lameness of sandcrack at the toe is much more serious than when the injury is at the quarter.

Fig. 52.—Heart-shaped bar shoe.

PRINCIPLES OF TREATMENT.—Sandcrack should be treated according to the following principles:—(1) To prevent movement between the edges of the crack, so as to stop its extension, and to obviate the chance of the sensitive, underlying tissues becoming pinched between the hard edges of the fissure; (2) to heal the exposed tissues if they are in a wounded or inflamed state; and (3) to favour the downward growth of sound horn from above the crack; for, as the edges of the crack cannot reunite, we must look to the growing down of the crack as the only effective cure. The gravity

of the case chiefly depends on the extent to which the coronet is involved.

TREATMENT.—If much lameness is present, the foot should be kept in water or poulticed, for a day or two. If, after this, the lameness continues, the part should be freely opened out with a searcher, and suitably treated; for we may rest assured that its persistence, then, indicates the presence of mischief in the interior of the foot. After "bottoming" the crack, we sometimes see copious granulations (proud flesh) protruding into it. These granulations should not be interfered with; as they will subside with the inflammation on the removal of the cause of irritation. In the treatment of the inflamed tissues within the fissure, nothing further need be done than keeping the part clean and covering it over with tannoform or iodoform.

After the inflammation has gone down, or if it has not manifested itself to any marked extent, we can proceed to the direct treatment of the injury in the horn, which may be considered under two conditions: (1) When the crack does not extend up to the coronet; (2) when it reaches that part. In the first case we may cut, with the searcher, a groove about an inch long, across the upper extremity of the fissure and parallel to the coronet, so as to protect the part from the effects of concussion, and to allow the horn to grow down intact. The groove should be made as deep as possible, without injuring the sensitive parts: an accident which would usually be manifested by the appearance of blood. Another and similar groove may be made at the lower extremity of the crack, in order to prevent motion between the divided edges, and also to stop the fissure from invading the sound horn below. If these means are not sufficient to save the sensitive parts from becoming pinched between the edges of the crack, we may apply clasps—as will be explained further on—to keep the edges together, and also to prevent the lodgment of grit and dirt; or we may open out the crack with a fine searcher, and keep the grooves which are made, constantly filled with some adhesive mixture, such as that mentioned on page 202, or suet and beeswax, in proportions suitable to the climate. We may apply lanoline (p. 204) to preserve and increase the cohesion of the fibres of the wall, one with another. The coronet should be stimulated to secrete stronger horn by rubbing into it, every second day or so, a little weak cantharides ointment, say, 1 to 24 of lard. A bar shoe—with a bar across the centre (Fig. 51), so as to give frog pressure; or heart-shaped (Fig. 52) if the animal is required to go beyond a walk—may be applied; the sole and wall immediately below the crack having been previously eased off to avoid pressure. The disadvantages

of the ordinary bar shoe (Fig. 53) are that it does not put pressure on the frog, and that it is liable to get caught by the hind shoe. The shoe should be moderately stout, so as to lessen the effects of concussion. With sandcrack at the toe of the hind foot, a shoe with side-clips, like those used for hunting, may be employed.

When the crack extends to the coronet, or when it goes too close

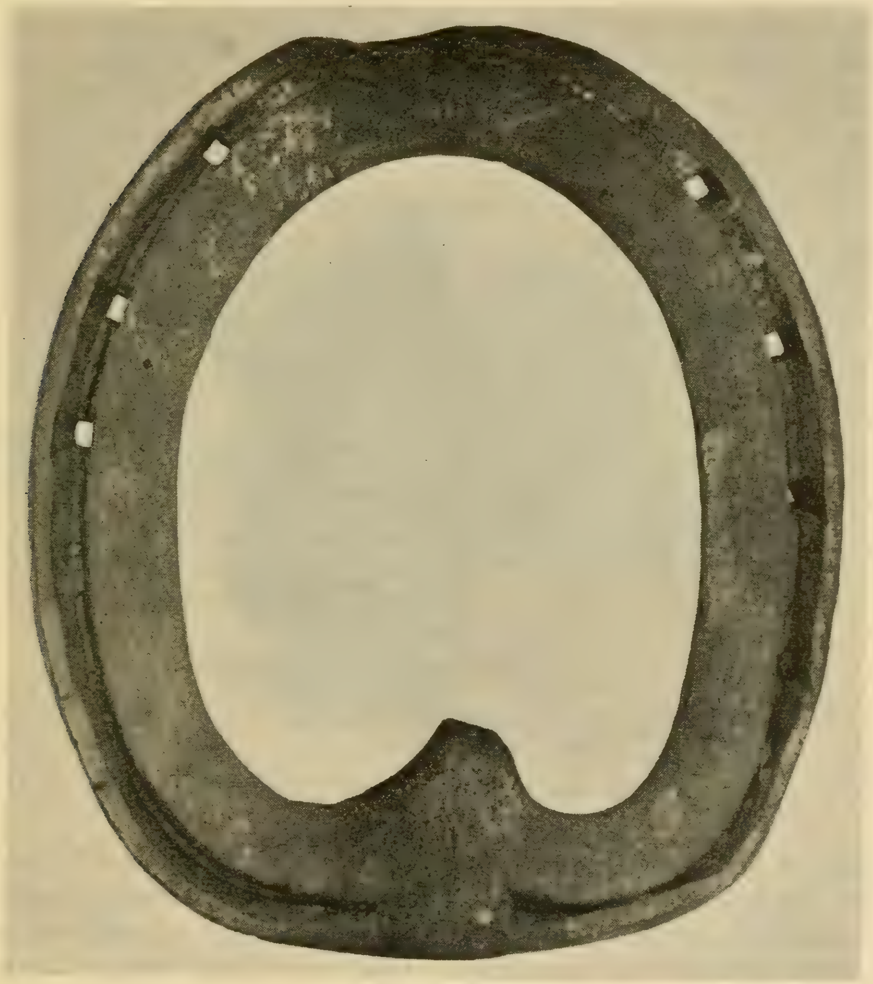


Fig. 53.—Ordinary bar shoe.

to it to allow a groove being made at the upper extremity of the fissure, I would advise the adoption of the method known among French veterinary surgeons as *le procédé Castandet.* It is performed as follows (Fig. 54):—Commencing at the coronet, about half an inch away from the crack, on each side, cut with the searcher two grooves, so that they may meet, in the line of the fissure, at an

angle of about 80°; thus making a figure more or less in the form of a V. The grooves should be cut, as before directed, through the hard, outer horn, and partly through the soft, white layer. When the proper depth, throughout, has been reached, the triangular portion of horn which has been left between the two grooves and the coronet, will readily "give" to the pressure of the thumb. The previously detailed precautions as to filling up the grooves, oiling the wall, stimulating the coronet, shoeing, and easing off the horn on the ground surface of the wall immediately below the crack, should, here, also be observed. The grooves should be made independently of the downward extent of the fissure; for our object is to isolate, from the effects of concussion, that presumably weak

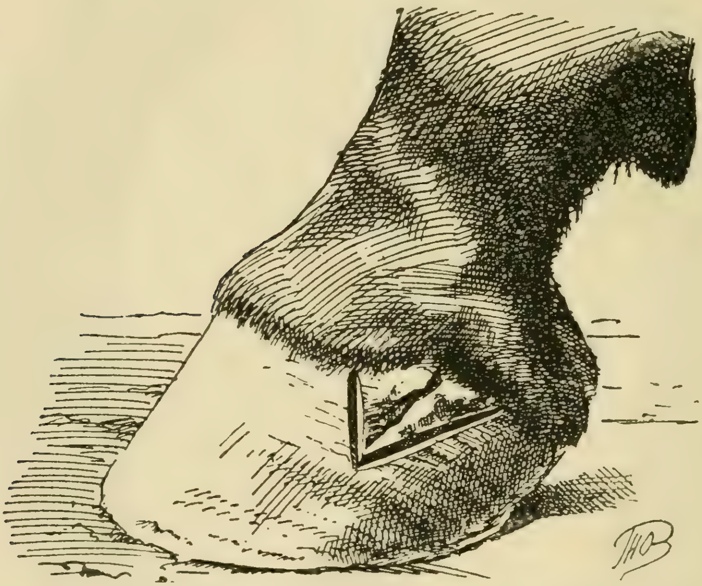


Fig. 54.—Operation for sandcrack.

portion of the coronet which is immediately above the crack, and which has to secrete new, sound horn in place of the broken horn; and, also, to prevent motion between the divided edges close to the upper extremity of the fissure. It is well to pare away as far as practicable the two pieces of isolated horn which are within the V; for their presence may cause irritation.

If the crack extends below the point of meeting of the two grooves, a third groove may be cut across its lower end.

The grooves should be first made by burning through the hard outer layer of horn with a narrow and curved red hot iron (Fig. 55), so as to mark out the way for the searcher, and to prevent the horn splitting.

The French method of *clasping* is performed by heating the

points of the instrument A (Fig. 56), and then by burning holes in the hoof with them at equal distances from, and at opposite sides of, the crack. The ends of the clasp B are now fitted into the holes made by A, and the clasp is tightened by a powerful pincers, made for the purpose, in order to bring the edges of the fissure closely

Fig. 55.—Iron for burning grooves in hoof (full size).

together. This is an easy operation. Vachette (" Recueil de médecine vétérinaire ") advises that the holes should be made very narrow, so that the points of the clasps will have to be forced into them; that the horn should be allowed to cool down completely before the

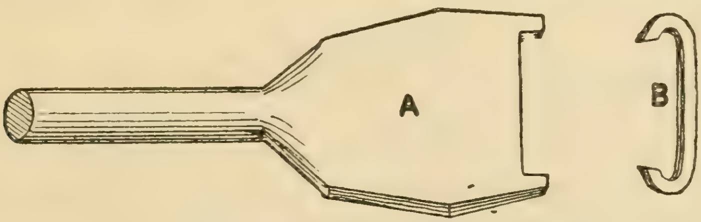


Fig. 56.—Instruments for clasping a sandcrack.

clasps are put in; that it is advisable to use as many clasps as there is room for them, the clasps being placed about two-fifths of an inch apart; that the clasps should not be covered with any greasy material, which might cause their hold to become loosened; that it is well to wet them with vinegar or with an acid, so as to facilitate

their oxidation, and, thus, to increase their adhesion to the horn; that the clasps should be protected by a leather strap; and that, as soon as the hoof grows sufficiently down, say, in three or four weeks, a fresh clasp should be placed above the topmost one. A second method of clasping, but one requiring the aid of a skilful smith, is to cut a small groove, about a quarter of an inch deep, at each side of, and parallel to the crack; each groove being about half an inch away from it. A small, broad horse-nail, with its point hammered flat, is now driven so as to enter at one groove and to come out at the other (Fig. 57). The edges of the crack are brought together with the pincers; the head of the nail is cut off, and both ends are clinched. A third method, which can easily be done at the toe, consists in drilling a hole through the horn, and then using a round nail in a manner similar to the way just described. If the assistance of a good smith be procurable, the second plan is more effective than the third, which, however, is the safer of the two.

As a rule, a sandcrack will take about a year to grow down.

After the cure has been effected, use shoes which are perfectly flat on the foot surface; avoid "thinning" the sole, or even touching it with the knife; and obtain frog pressure, which may be done by keeping the hoof short, taking care not to interfere with the proper slope of the foot, and by using tolerably thin shoes. The coronet may be stimulated from time to time, by cantharides made into an ointment at a strength of about 1 to 24 of lard.

Cases of sandcrack which have occurred under the predisposing influence of indigestion should be treated, generally, for indigestion; and, locally, for sandcrack.

LEGAL ASPECT.—Sandcrack is an unsoundness. "If a horse without any indication of having previously had the disease, throw out a sandcrack immediately after sale, it is no breach of warranty" (Oliphant's "Law of Horses").

False Quarter

is a longitudinal depression in the wall of the hoof, due to non-secretion of the horny crust by the coronet. This loss of secreting power is caused by an injury—such as tread or quittor—which has destroyed the horn-secreting cells. The horn which covers this depression appears to be derived, principally, from the sensitive laminæ. False quarter may commence at any part of the coronet; but is most common at that from which it takes its name.

To guard against tricks played with sandcracks and false quarters, it is advisable, before buying a horse, to have his feet washed.

TREATMENT can only be palliative. Here, as directed for sandcrack, the effect of a blister on the coronet may be tried.

Split Hoof.

Under the above heading I wish to include those divisions of the horn of the foot which do not take the characteristic form of "sandcrack."

The chief varieties of this accident are as follows:—

1. A split of the hoof which, as the result of concussion, presumably on hard ground, commences on the ground surface of the foot at the bottom of the groove that separates the heel, at either side, from the frog, and extends through the horn, more or less up to the coronet at the back of the pastern.

If there be lameness, poultice the foot for a couple of days; open out the fissure freely with a fine drawing knife or searcher; lower

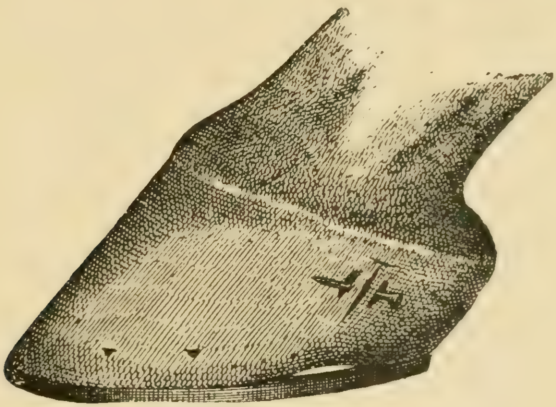


Fig. 57.—Clasping a sandcrack with a nail.

the heels so as to take pressure off them; apply a bar shoe which will throw weight on the frog (Fig. 51 or Fig. 52); and rub a little weak blistering ointment (cantharides, 1 to 24 of lard) into that part of the coronet which is immediately above the crack, every second day or so, in order to stimulate it to secrete strong horn.

The opening out of the fissure is done to prevent the sensitive parts underneath from becoming pinched, when the horse places his foot on the ground.

2. The wall of the hoof sometimes splits at its lower extremity, thus forming a sort of spurious sandcrack. This fissure rarely extends higher up than a couple of inches. Treat as for sandcrack which does not extend up to the coronet.

3. A horizontal division of the horn which, generally commencing a little above the heels, extends in a forward and slightly upward direction. Beyond carefully cutting it out, it will not require any special treatment.

4. The horn at the coronet sometimes separates horizontally for a little distance, and forms a cavity in which water and dust may lodge. Every part of the detached horn should be cut away with the drawing knife, and the coronet above the fissure should be stimulated with cantharides as before described.

Acute Laminitis (*Congestion and Inflammation of the Feet*).

Founder is the old name by which this disease was known.

SYMPTOMS OF ACUTE LAMINITIS.—The characteristic symptoms in the feet are always, as Peuch and Toussaint point out, preceded by general symptoms of dulness and distress. There is loss of appetite, increased thirst, and diminution in the quantity of urine. The gait is unsteady, although not as yet characteristic of the malady. When the symptoms become developed, which may happen in a period varying from a few hours to several days, the horse will try to relieve the walls of the affected hoofs of pressure by, if the malady be in the fore feet, stretching them forward so as to throw weight on the heels, and by bringing the hind feet, as much as possible, under the centre of gravity of the body. But, if the disease be confined to the hind feet, the animal will draw back his fore feet under his body, and will advance the hind ones, so as to relieve their toes of pressure; and the head and neck will be bent down, in order to take weight off the hind legs, by putting it on the forehand. The horse evinces uneasiness in the affected feet. Generally, there is a considerable amount of heat present in the hoofs; the coronets are full and more or less hot; the arteries which run down the pasterns throb; and the affected limb is usually "filled" below the knee or hock, as the case may be. Tapping the foot even lightly causes pain. The horse objects strongly to any foot being taken up, if, by doing so, weight be thrown on an affected leg. He suffers great distress, especially when the hind feet are attacked. He is most unwilling to move; and, in a first attack, is generally very averse from lying down; but in subsequent ones, he usually appears only too glad to get the weight of his body off his feet. During movement, he tries to save the toes of the affected feet from pressure by putting it on their heels. The breathing is hurried, and the lining membrane of the eyelids (the conjunctiva) is more or less red from congestion, and is sometimes tinged with yellow. The state of the breathing is apt to give rise to the idea in the minds of inexperienced observers, that the animal is suffering from inflammation or congestion of the lungs. The pulse is full and hard, and differs in this respect from

that in the large majority of other diseases, in which, if the pulse be hard, it will also be small.

Although the attack, especially if slight, may pass off without any well marked injurious result on the affected foot; its tendency is to cause the pedal bone to " drop " to a greater or less extent, in which case the profile of the foot will subsequently assume a concave appearance (Fig. 58), and the toe of the hoof will become greatly thickened by the new growth of horn, as we may see by comparing Fig. 60 with Fig. 61. At other times, hæmorrhage (bleeding) takes place inside the hoof, or an exudation may be formed within it, and may also cause displacement of the point of the pedal bone, though without the increased formation of horn. Hence, when these fluids are removed, a cavity will be found between the wall and the pedal bone, and partly filled up by the dried remains of the blood or exudation. We have here the condition known as " seedy-toe." In it, the secreting membrane of the hoof does not produce an excessive quantity of horn as it does in the other case. When the inflammation is intense, the amount of exudation or suppuration, whichever is present, may be so great as to force away the hoof, at the coronet, from its secreting membrane, and thus to cause the hoof to become shed. If the animal survives this terribly severe accident, the old hoof will be replaced, in time, by another of weaker and more imperfect horn. In the event of recovery after the point of the pedal bone has come through the sole, the protruding part will, if allowed to do so, drop off, and the remainder of that portion of bone which has been brought close to the sole, will become more or less absorbed. The exposure of the sensitive parts to the action of air, water, and especially dirt, may be followed by a tedious suppurating wound, and possibly by blood-poisoning. When displacement of the pedal bone has taken place, the sole becomes thin, weak, and, as already remarked, more or less convex, which is a condition that is popularly known as " dropped sole " (Figs. 59 and 60). It is evident that such complications would very seriously diminish the usefulness of the animal.

Figs. 62 and 63 show the foot of a leg that had evidently suffered from rupture of the perforans tendon (p. 37), which was consequently unable to keep the toe down. Hence the animal went on its heel, as in laminitis, for which disease the injury in question was probably mistaken, as the toe was allowed to become unusually long. The characteristic concavity of the profile of the foot and the irregular rings of horn indicative of laminitis (Fig. 59) were, however, wanting; and there was no " dropping " of the pedal bone, as we may see by Fig. 63.

In all cases, laminitis shows a great tendency to recur, and also to become chronic.

CAUSES, PREDISPOSING CAUSES, AND PREDISPOSITION. —1. *Want of exercise* is a frequent cause of laminitis among horses which are sent on long sea voyages and which are not able to lie down, as I have pointed out in "Horses on Board Ship." In such cases, it is more correct to refer the disease to inaction, than to long-continued standing; because such animals are far more liable to get laminitis during fine weather, than when the sea is rough, Also, their risk of becoming affected is greatly decreased by giving them even a quarter of an hour's daily exercise, which is seldom possible, except when the equine cargo is small as compared to the size of the vessel. Inaction can also be a predisposing cause, as we shall see in the following paragraph. Laminitis sometimes occurs from want of exercise on land, when horses are tied up in stalls or boxes, owing to injury or disease, and are not allowed to lie down; and also when they refrain from lying down, owing to the fact of their suffering from certain diseases, especially those of the chest. Horses, under natural conditions, spend such a large proportion of their time in almost constant movement, that the usual long periods of enforced idleness in the stable have a very deleterious effect on the soundness of the legs, by the consequent congestion which is set up, particularly in their feet.

2. *Excessive work*, especially at fast paces and on hard ground. The amount of work capable of producing the disease, is proportionate to the ability of the feet to bear it with impunity. Here, continued want of exercise has a particularly strong predisposing effect. Thus, horses which in ordinary working condition could trot for thirty miles on a hard road without any bad result, would in all probability get laminitis, if walked, say, five miles immediately on landing after a month's journey by sea; provided they had to stand up the whole time, and had had no exercise. Equally bad effects would of course be produced under similar conditions on land. Inattention to the predisposing influence which want of exercise has in setting up laminitis, has been the cause of many thousands of recently landed horses being rendered unfit for service during the late South African war. Laminitis brought on by excessive work is much more intractable than laminitis due to all other causes, except that of infection of the womb after foaling.

3. *Intestinal congestion*, caused by indigestible food, severe purgatives, etc. Purgatives like aloes and Epsom salts act by producing congestion of the mucous membrane of the intestine, which causes a discharge of watery fluid from that membrane into the bowel, and consequent purging. When food is to blame in this respect, it generally consists of wheat, barley, or maize given in excessive quantities.

4. *Inflammation of the womb* from foaling (*septic metritis*).

Fig. 58.—A foot which has suffered from laminitis.

Fig. 59.—Foot suffering from "dropped" sole. A considerable portion of the wall of the hoof, at the toe and quarters, has broken off.

Mr. R. Over, M.R.C.V.S., who has a large experience in foaling cases, tells me that this form of the disease (parturient laminitis) very rarely occurs, unless the fœtal membranes (after-birth) have been retained for at least twelve hours, especially in heavy breeds, such as Shires; and that light mares bear retention better than cart mares. Tisserant, who, in 1846, was the first to note this particular form of laminitis, states that it generally occurs after abortion, or after a difficult delivery. It is an extremely dangerous variety of laminitis.

5. *Debilitating diseases*, like influenza, particularly when they weaken the action of the heart, predispose to laminitis.

6. *Undue weight being placed on one leg*, on account of its fellow fore or hind leg being in a painful condition from injury or disease. Professor W. Williams describes an interesting case of a horse which had hurt his near hind leg. The foot of this leg was wrongly left unshod, but shoes were put on the other three feet, with the result that the off hind became violently affected with laminitis, by reason of the extra weight thrown on it.

7. *Undue weight of body as compared to the strength of the feet* predisposes an animal to this disease. Mr. Broad says: "I have known it to occur to fat horses which have been at grass for months without having been haltered."

8. *Improper shoeing* which relieves the sole (by the use of a seated shoe) and frog (by cutting away the frog, and refraining from lowering the heels) from pressure, predisposes an animal to laminitis, by putting almost all the weight on the wall of the foot. The pernicious effect of this method of shoeing is naturally greater on hard roads than on soft ground.

9. *Corn.* On two voyages to South Africa with remounts, of which I was in veterinary charge, and on several voyages to and from India and to Russia with private animals, I had ample opportunities of seeing that corn has a strongly predisposing influence on the production of laminitis in idle horses. I found that hay has no deleterious effect in this respect. Consequently, when horses are taken long voyages by sea, they should have plenty of hay, but little or no corn. Dr. Arthur Luff has shown in his book on gout, that the mineral matter of fruit and green vegetables (among which we must number hay, as it is dried grass), when taken into the system as food, has a strong action in eliminating uric acid, the retention of which in the body is the cause of gout (p. 524); but that the mineral matter of grain has no such influence. It is therefore reasonable to infer that the so-called "heating" effect which corn has on idle horses, is due to the accumulation, in their systems, of waste and harmful products which the mineral matter

of hay or grass, combined with exercise, would remove under healthy conditions.

I am convinced that laminitis very rarely occurs from only one cause, except in foaling cases.

"Attentive observation of facts demonstrates that laminitis attacks equally all horses, whatever may be the shape of their hoofs" (*Peuch and Toussaint*). At the same time we must not forget that the more upright the foot, whether caused by shoeing, allowing the heels to grow too long, or by conformation, the more liable will it be to suffer from laminitis induced by concussion, and by long-continued standing; for the more the weight is brought forward, the greater will be the strain on the secreting membrane of the hoof. An upright form of pastern will act in the same way.

As the fore feet are far more exposed to the effects of concussion than the hind, and as they are not so frequently moved when the horse is standing, we generally find that one or both of these feet are alone implicated in an attack of laminitis, whether the disease proceeds from congestion or from injury.

NATURE OF THE DISEASE.—The whole body of the horse (like that of a man) is covered by a membrane which acts as a filter for the removal, from the body, of watery fluid and waste products contained in it. Thus, in the lungs, it gives off water and carbonic acid; and on the surface of the body, principally water in the form of perspiration. The kidneys, which are a peculiarly modified portion of this covering, discharge urine. Besides its office as a filter, it has the power, to a certain extent, of altering the composition of the waste material which passes through it, chiefly as a protective layer, in the form of epithelium (p. 154) which assumes special characters according to its position. Thus, the true skin excretes scarf-skin (p. 154) and hair; and the membrane which covers the sensitive parts of the foot, secretes horn. At the coronet, the horn-producing membrane excretes the wall of the hoof; on the outer surface of the pedal bone (Fig. 70, p. 209) it excretes soft horny cells which bind it (the *sensitive laminæ*) to the wall; and underneath the foot it excretes the sole and frog.

The growth of this protective covering (epidermis) is dependent on the amount of serum (watery portion of the blood) which accumulates inside the secreting membrane. Hence, the slower the superficial circulation, the thicker will be the protective covering. Thus, the colder the climate, the more developed are the hair, hoofs, and horns of animals which live in it. A blister and pressure (as in the case of corns from tight boots) increase epidermal growth in a similar manner. Comparative stagnation of blood

Fig. 60.—Vertical and longitudinal section through foot shown in Fig. 59.

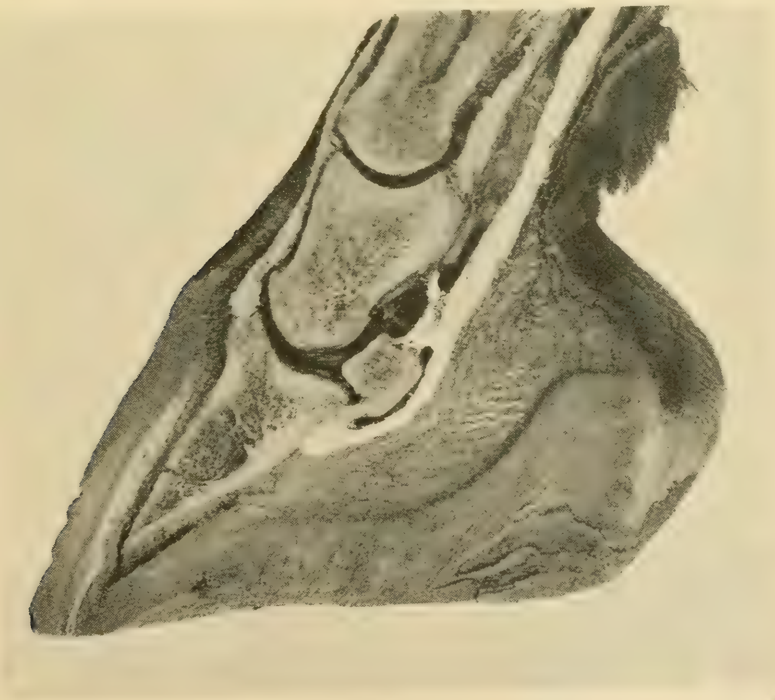


Fig. 61.—Longitudinal section through a healthy foot of a horse.

plays its part as the epidermal stimulant in "filled" legs, grease, human tuberculosis (consumption), and diseases of the heart. The fine and scanty coats of horses which are warmly clothed, well exercised, and vigorously groomed, or which inhabit hot climates, show the effect that increased superficial circulation has in diminishing epidermal growth. We also find that certain high fevers in man cause loss of hair.

The abnormally large amount of horny matter which is excreted by the sensitive laminæ in cases of acute laminitis, is undoubtedly due to congestion or stagnation of blood, and not to inflammation. Peuch and Toussaint explain that "dropped sole" is caused by the rapid secretion of this new horn, which, being continually secreted, exercises enormous pressure between the hoof and the pedal bone, and finally forces the point of the latter down and reduces the slope of the former.

Siedamgrotzky maintains, on the contrary, that "dropped" sole is due to the pull of the perforans tendon, when the animal bears weight on his feet, causing the toe of the pedal bone to rotate downwards and backwards, at a time when the connection of the front portion of the pedal bone with the hoof, by means of the sensitive laminæ, has become weakened by the presence of inflammation. To accept this theory, we must assume: Firstly, that in health, the action of the perforans tendon, during the maintenance of the standing position, and still more so during movement, is directly and to a marked extent opposed to the connection which exists between the sensitive laminæ and the hoof at the toe. Were this the case, we would have frequent instances of inflammation occurring in the sensitive laminæ from violent strain thrown in heavy draught on the perforans and especially on that of the hind leg, in which laminitis is very rare. Such a cause of injury appears to be unknown. Further than that, the connection between the hoof and the sensitive laminæ is particularly strong, as we may easily prove by experiment on the dead hoof. In fact, the hoof acts as a boot which fits the sensitive structures within it comfortably, though closely, even during the severest exertion. Secondly, that if the wall of the hoof were removed, the point of the pedal bone would "drop," which, experiment shows, it will not do. Thirdly, that the point of the pedal bone of a horse suffering from a severe attack of acute laminitis will not "drop," if the animal is kept lying down; an assumption which is not borne out in practice; for although the maintenance of the recumbent position aids recovery by placing the parts at rest and by facilitating circulation, it is powerless to stay the progress of the disease, in bad cases, as regards the displacement of the pedal bone. Against Siedamgrotzky's theory, I venture to advance the argument that if the painful separation between the anterior portion of the hoof and the pedal bone was caused by the pull of the perforans tendon, the suffering animal would not, as he does, add to this pull by placing weight on his heels.

Möller observes with great acumen that the peculiar gait (bringing the heel first on the ground, with the toe unduly raised) of a horse with "dropped" sole, even after all inflammatory action has ceased, is due to relaxation of the perforans tendon caused by the backward and downward rotation of the pedal bone. Here, we should bear in mind that the action of the flexor perforans antagonises that of the extensor pedis, which raises the toe. This peculiar gait is usually accounted for by the assumption that this manner of progression is adopted by the horse to save his foot from painful pressure. Although this is undoubtedly true in recent instances, even without displacement of the pedal bone, it cannot be correct for every case of "dropped sole,"

in many of which, inflammatory action has long ceased to exist. We also find that depriving the foot of the sense of feeling, by neurotomy (p. 669), does not alter the gait.

We may reasonably conclude that in cases of sloughing or shedding of the hoof in acute laminitis, the cause is inflammation as a sequel to congestion.

With respect to the fact that congestion of the mucous membrane may set up acute laminitis, we should bear in mind that the mucous membrane, skin, and sensitive laminæ are a continuous structure, and that congestion in one part is apt to spread to another part, especially under the predisposing influence of want of exercise. The special liability of horses' feet to suffer from the bad effects of congestion, is due to the rigidity of the hoof which covers its secreting membrane, and to the long time the animal remains on its feet.

Laminitis begins as congestion, and may run on into inflammation of the sensitive laminæ. We may regard it under two forms, namely: (1) caused by passive congestion (p. 14); and (2) due to active congestion brought on by injury, as, for instance, concussion. These varieties may be divided into acute and chronic. We may look upon sub-acute laminitis as intermediate between the acute and chronic forms.

DISTINGUISHING ACUTE LAMINITIS FROM OTHER DISEASES.—This affection may be mistaken for pneumonia, paralysis, sprained back, disease of the kidneys, and hæmoglobinuria. Any such error in diagnosis can be obviated by observing the nature of the pulse, the peculiarity of the gait and of the position when standing, the local symptoms of heat and tenderness in the feet, and the congested state of the blood-vessels of the coronet. The attempt to put weight on the heels during movement is specially noticable, if the animal be forced to rein back.

PRINCIPLES OF TREATMENT.—The nature of the pulse (that of high arterial tension, see page 358) clearly indicates general bleeding. Our attention should evidently be directed to restore the impeded circulation, and to promote repair.

TREATMENT.—Cases of laminitis in which the attack is slow (as those produced by long standing) are best treated during their early stages, by applying evenly distributed pressure below the knee or hock (according to the seat of the disease) by means of cotton wadding bandages (p. 45); gentle exercise a few times a day; making the animal lie down during his periods of rest; keeping him on green grass and roots; and allowing him plenty of water to drink. He should on no ac-

Fig. 62.—Foot of leg which had suffered from rupture of the perforans tendon.

Fig. 63.—Longitudinal and vertical section of foot shown in Fig. 62.

count be given any corn. If he is in any way constipated or even if his dung is in a natural condition, it would, as a rule, be well to give him a pint of linseed oil, and to assist the effect of this mild laxative with an enema (p. 632) or two of a gallon of lukewarm water. If diarrhœa is present, he should get neither a purgative nor an astringent. The shoes should be removed, and if the wall is high, it should be lowered, so as to put pressure on the sole and frog; but the sole should on no account be pared. Three or four ounces of bicarbonate of soda may be given daily with advantage in bran mashes, supposing that green food is not available, or in the drinking water, or in two or three drenches.

The treatment of a severe attack, whether it comes on suddenly, or is the result of neglect, is generally very unsatisfactory; hence the difference in the views which are entertained respecting its nature. In addition to the curative measures just described, it is advisable, as recommended by Cagny and Gobert, to remove from 4 to 8 quarts of blood from the jugular vein; but bleeding from the coronet or toe should not be done, because these operations are liable to injuriously interfere with the local circulation.

Aloes as a purgative does not, as a rule, act well, apparently because it irritates the mucous membrane of the intestines, with which the secreting membrane of the foot is in close sympathy. As a purgative, a subcutaneous or intratracheal injection of eserine and pilocarpine (p. 609) is far preferable to aloes.

The best local treatment is walking the horse through cold water; or, if this cannot be done, standing him in cold water. Standing him in warm water or poulticing the feet has a bad effect in promoting congestion. During the intervals, allow the horse to lie down as much as possible. If he will not do so of his own accord, throw him gently (p. 641). The advisability of doing this is shown by the pulse, after the horse is down, always falling in a marked manner. After some days, when convalescence sets in, use Broad's shoes, which are "extremely stout, wide-webbed, and long bar shoes, made from iron about twice the ordinary thickness of those of the particular animal under treatment; make them gradually thin from behind the quarter, so that the heel part of the shoes may be as wide and thin as possible, and fitted rocker fashion to allow the weight of the horse to be on that part; put them on with leather soles, using only sufficient nails to ensure their staying on" (*Broad*).

French veterinary surgeons advise that after the horse has been made to lie down, the foot should be lowered, and the sole pared thin, so as to allow of expansion; and in the event of an accumulation of blood, exudation, or pus being suspected within the foot, that an excavation for its liberation should be made at the toe,

somewhat similar to that for a prick in shoeing. English practice is opposed to thinning the sole.

If constipation or colicky pains be present, give a drachm of extract of belladonna, or 40 drops of liquor atropiæ sulphatis subcutaneously (p. 633) and linseed oil; supposing that an injection of eserine and pilocarpine has not been tried.

A short, slow walk, say, of a hundred yards at a time, should be enforced in cases which arise from idleness and continued standing, as may happen on board ship. After landing healthy horses which have been at sea for three weeks or longer, it is advisable to keep them for a week or ten days in loose boxes; so that they may recover the use of their feet, before they are, very gradually, brought on to work. A walk, even of a couple of miles, immediately after coming off ship, is apt to set up laminitis; although, previously, no symptoms of that disease had been apparent. For further information on this subject, see "Horses on Board Ship."

When the hind feet are affected, the horse is often prevented from staling, by the pain the act of stretching himself out would cause him. In these cases, the urine should be drawn off by the catheter (p. 655) three or four times a day.

After an attack has passed away, employ Broad's rocker shoes, which have been just described, and blister the coronet.

Schumacher, a Belgian veterinary surgeon, has had great success in severe cases of laminitis by the hypodermic injection of a solution of $1\frac{1}{2}$ grain of hydrobromate of arecoline in $1\frac{1}{2}$ drachm of water, daily, for four or five days. In recent cases, he bleeds freely.

PREVENTION OF PARTURIENT LAMINITIS.—If the mare does not cleanse in 6 or 8 hours, the membranes should be removed by an expert, and the womb washed out twice daily with a suitable antiseptic fluid (p. 67). Mr. R. Over points out to me that if the mare is a shiverer (p. 565), recovery is doubtful, even if the attack is only moderately severe; because her nervous ailment will not allow her to adjust her weight properly. Mr. J. S. Barber, M.R.C.V.S., advises that, on the slightest sign of parturient laminitis, the mare should be bled freely.

Chronic Laminitis.

Peuch and Toussaint define chronic laminitis as that condition of the foot in which the inflammation of laminitis has produced deformity of the hoof (Figs. 58 and 59). We are quite safe in assuming that when such deformity exists, the foot has invariably lost a certain amount of its strength and usefulness, and that it is abnormally liable to suffer from an acute attack of this disease.

On the other hand, I have owned at least two horses which moved, under conditions of hard work, in a manner characteristic of animals affected with chronic laminitis in front, although their fore feet presented no trace of that disease.

The horse owner's attention may well be directed to this not uncommon disease; as it is both serious in its nature and insidious in its approach.

In cases of chronic laminitis, the horse throws the weight on the heels and consequently walks with a more or less straight knee, in a sort of a "fair heel and toe" manner; the action being very different from that due to navicular disease, which causes the horse to "dig his toes into the ground," and thus to wear away his shoes in front. A horse suffering from laminitis of the fore limbs, will, when in movement, unduly advance them, so as to throw the weight on the heels, which an animal with navicular disease will avoid doing as much as possible, and will consequently adopt the opposite style of progression. Although, when walking, the fore feet are advanced more than in health, the steps taken are shorter than usual. As a rule, there will be some heat present in the affected foot or feet, especially after work. The peculiar position assumed by the horse when standing in the stable, trying as he does to throw weight on the heels, is generally characteristic. Usually, the profile of the foot, from coronet to toe, becomes more or less concave; the sole, flattened or even convex; the horn weak and brittle; the thickness of the horn at the toe on the ground surface of the foot, greatly increased; and the frog larger than usual, the stimulated development of the frog being a result of increased pressure, and not of disease. In almost all cases, the frogs of feet which have been subjected to the influences of shoeing for a considerable time, become far smaller than they would have done, had the horse remained barefoot. Consequently, we are apt to regard as normal, a condition of frog which is peculiar to shod feet. Feet affected with laminitis are, as a rule, distinguished by rings of horn which run irregularly, but close together, round the foot (Fig. 59). In a healthy hoof, there is generally only one ring (Fig. 64), which is due to the change in the season of the year causing a difference in the activity of the cells that secrete horn. Sometimes, to hide the defect, the rings brought on by this ailment are neatly rasped away. It is easy to understand that the growth of such rings will usually take place in an irregular manner. The periodical fluctuation in the normal activity of these cells occurs at the same time as that of the cells which secrete the coat. Thus, in the ordinary course of events, when a horse sheds his hair, the growth of horn is languid; and when he assumes his winter's coat, it is vigorous.

A horse suffering from chronic laminitis does not work sounder

when he "warms up," as he does when affected by navicular disease: on the contrary, he works lamer and lamer. Seedy-toe (p. 201) often accompanies chronic laminitis. Although unfit for hunting and trotting on hard roads, the animal may be capable of useful work on a farm.

TREATMENT.—In chronic laminitis, or in cases having a tendency to it, the sole and frog should be allowed to remain untouched by the drawing knife, but the wall should be kept well rasped down; care being taken that the shoe does not press on any sensitive part of the sole, which is usually in an abnormally thin condition. Leather, placed between the wall and the shoe, by diminishing the effect of concussion, is often of service, though its presence will somewhat lessen the hold of the nails. Pressure on the frog, which is the natural buffer of the foot, is essential to improvement. In bad cases, Broad's shoes (p. 197) should be used; but if the animal be but little affected, a heart-shaped bar shoe (Fig. 52) will be sufficient. The heels, also, may be somewhat lowered; for although this will throw an increased strain on the suspensory ligaments and back tendons, it will materially lessen the jar on the sensitive laminæ—the lesser of the two evils. I have seen several cases of cart-horses which, from chronic laminitis, were unable to walk in ordinary shoes without great lameness, do their work with apparent soundness of gait, in Broad's shoes. A little cantharides ointment, say, 1 to 24 of lard, may be rubbed into the coronet every second day or so, in order to stimulate it to secrete stronger horn. After work, if there is any heat present, the horse should be made to stand with his affected feet in cold water for some time. In the stable he should have plenty of straw placed under him, and have the stall darkened, so as to induce him to lie down as much as possible. Above all things, he should not be worked on hard ground, or with a heavy weight on his back.

M. G. Joly ("Vet. Record," 19th April, 1902) has had wonderfully good success in the treatment of chronic laminitis, by ligaturing one of the digital arteries (either the external or the internal). The operation is performed above the fetlock, at the spot where high plantar neurotomy (p. 669) is done. Two ligatures (preferably of silk) are made a little distance apart, and the artery is divided between them. The effect of this operation is to greatly reduce the congestion in the affected part. In any case, no bad results need be feared.

LEGAL ASPECT OF LAMINITIS.—Any existing inflammation in the sensitive laminæ or coronet, or any alteration in the shape

or structure of a foot which would indicate that the horse had suffered from laminitis, is an unsoundness.

Seedy-Toe

is the term applied to a cavity formed within the wall of the hoof and extending from the ground surface in the direction of the coronet. It is usually best marked at the toe, but may also extend round the quarters.

Fig. 64.—Healthy ring of horn.

CAUSES.—It may be due (1) to laminitis (p. 185); or (2) to causes, apparently, unconnected with that disease.

In cases coming under the second heading, very little displacement of the pedal bone seems to take place, and, generally, there is no suspicion of the existence of the cavity, until it is discovered by the shoeing smith. The cavity is partly filled with a soft, dry, cheesy material, which crumbles away on being rubbed between the fingers.

It is possible that seedy-toe may be brought on by long-continued strain on the feet which was not sufficient to produce actual lami-

nitis; although it might have given rise to perverted secretion by the sensitive laminæ, so that separation occurred between these structures and the wall, on account of their connecting material having lost its adhesive character. I have thought, in two or three well-marked cases which I have observed, that the disease was due to the habit the animal had acquired of never lying down. Percivall was of opinion that the pressure of the clip of the shoe was the chief cause of this ailment.

The existence of seedy-toe is readily seen on removing the shoes. Sometimes, the wall at the centre of the toe cracks, making a vertical fissure; and there is frequently a depression a little below the centre of the front part of the hoof, when viewed in profile. If the part of the wall which covers the cavity be tapped, it will emit a hollow sound.

TREATMENT.—Carefully remove with the searcher every particle of detached horn, until all appearance of a crack in the horn is gone. Apply a bar shoe. Rub into the coronet, every second day or so, a little weak cantharides ointment (1 to 24 of lard), in order to stimulate the part to secrete sound and strong horn. Apply on the newly-exposed surface, a light dressing of turpentine or paraffin oil, to prevent the invasion of parasites, and, then, keep it covered over with some of the following ointment to protect it from moisture:—

Lard or suet	1	part.
Venice turpentine	1	,,
Beeswax	$\frac{1}{4}$	,,

As the wall grows down, look out for the appearance of any fissure in the horn, which, on being seen, should be carefully pared out. Keep the feet dry. A cure is almost certain, unless the cause is laminitis, in which case it will be more or less doubtful.

If a horse is lame from chronic laminitis and has at the same time seedy-toe, it is useless to treat the latter complaint only, with the view of making him sound.

Seedy-toe is an unsoundness.

Pumiced Feet

is a term that is applied to a flat or convex condition of the sole, which is generally due to the descent of the pedal bone, as a result of laminitis (p. 184), and sometimes to the effects of work on hard ground, especially when seated shoes (p. 176) are used, without any symptoms of laminitis having been apparent.

The unnatural pressure of the displaced pedal bone interferes with the secretion of the horny sole, which accordingly becomes weak and thin.

To support the sole and to stimulate the sensitive parts of the foot to healthy action, we should gradually accustom the foot to the use of a flat, broad shoe, which at first may be thin at the heels, but as the foot becomes strong, we should use one of uniform thickness, keeping frog pressure in view. Apply to the coronet,

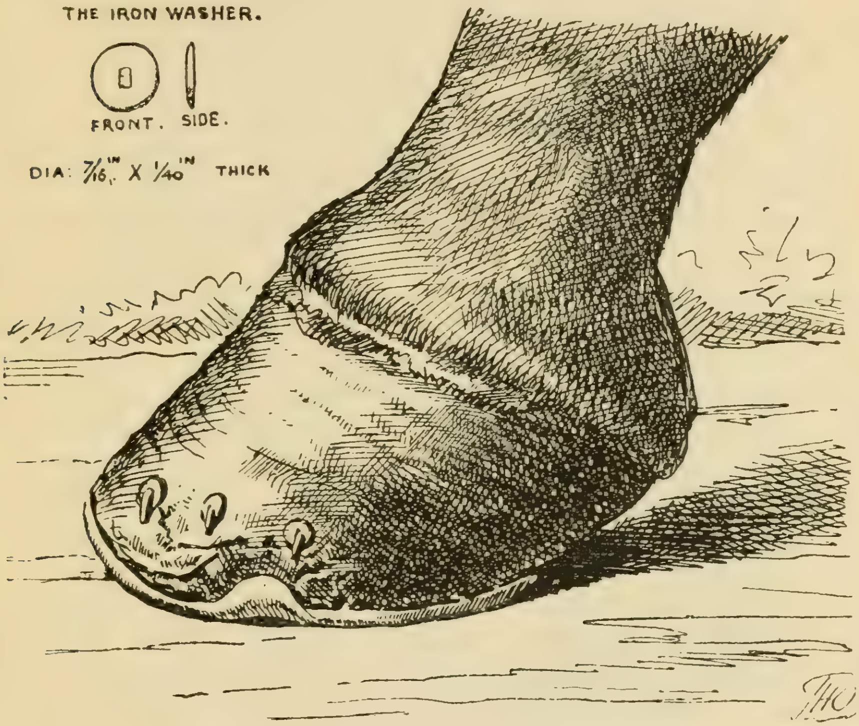


Fig. 65.—Securing the clinches of nails.

blistering ointment in the manner recommended for seedy-toe (p. 202), and avoid work on hard ground.

Brittle Feet.

Use broad, flat shoes, which will reduce the jar on the wall by throwing pressure on the sole; and obtain frog pressure. The shoes should be fitted on hot; for by doing so, they remain firmer on, owing to the more exact juxtaposition of the horn and iron. Clips should be used to save the nails from being shaken; and, for the same reason, calkins should be discarded. Rather fine nails should be employed; for coarse ones are apt to chip away the crust. As recommended many years ago by the late Mr. W. Thacker,

M.R.C.V.S., the nail holes should be punched well away from the outer edge of the shoe, so that the nails may take a good hold without having to be driven high up, which would be apt to start a chip off the crust. Keep the feet dry, and stimulate the coronet as advised for "seedy-toe."

An excellent method of preventing the clinches of the nails from chipping away the horn immediately below them, is, as has been suggested by Mr. H. W. Fraser, of Tirhoot, to use an iron washer placed on the end of the nail after it has been "driven," and before the clinch has been turned down. This washer (Fig. 65) is cut out of thin sheet iron; is circular in shape; is about one-third of an inch in diameter; and has a slit cut through its centre to fit the end of the nail. When the nail has been driven, the washer is fitted on the point, and is lightly hammered down by means of the buffer, or chisel, until it rests firmly against the hoof. The clinch of the nail is then turned down and is cut off just below the lower edge of the washer. In this manner, the horn is not weakened by having cut in it a groove in which the end of the clinch, according to the ordinary plan, is to rest. Besides, if any strain falls on the nail, it will be distributed over the surface of the washer, instead of being concentrated on the clinch; and, consequently, the hoof will be less liable to break away than by the ordinary method of shoeing. Supposing that we are shoeing a horse with five nails, we may have the three outer nails and the front one of the inner two nails supplied with these washers. I have tried this plan with excellent results.

Romnald Tobolewsky states that the application of lanoline renders the hoof tough. Before using it, the horn should be cleaned with cold water, and then the lanoline rubbed into the coronet and wall, in small quantities, by means of a woollen rag, until a dull gloss is produced. It can also be applied with advantage to the sole and frog.

Indigestion is not an unfrequent cause of brittle feet; owing to the sympathy between the mucous membrane of the stomach and intestines, and the sensitive laminæ, which secrete the horn of the foot. When irritation and consequent inflammation exist in a secreting structure, its powers become impaired; hence the cases of weak and brittle horn secreted during attacks of indigestion, which should be specially treated.

In cases of brittle feet which have become chipped away a good deal, we should apply to the exposed surfaces, from time to time, an antiseptic, such as paraffin oil, with the view of destroying any parasites which may be present, and which may, possibly, have induced the brittle condition of horn.

Inflammation of the Coronet (*Villitis*).

NATURE AND SYMPTOMS.—This disease, which French veterinary surgeons call *mal d'âne*, is almost exclusively confined to donkeys, even among which it is not very common. I have seen only a few cases of it among horses. It appears to be, in the first

Fig. 66.—Inflammation of the perioplic ring.

instance, a chronic inflammation of that portion of the coronet (the perioplic ring) which secretes the thin covering of horn (the periople) that covers the upper part of the hoof. This inflammation of the perioplic ring may extend to the remainder of the secreting portion of the coronet, so that the wall, especially at the front, becomes dry and fissured to such an extent that in time it resembles the rough bark of a tree which has become more or less detached from the wood (Fig. 66). In aggravated cases, this

altered wall breaks off at its lower part, and splits both horizontally and vertically.

The accompanying lameness, which always increases with work, is marked by a shuffling style of progression, especially when both fore feet are affected. The lameness may, after a rest, disappear for the time being; but only to return on the resumption of work.

The CAUSE of this disease appears to be unknown.

The TREATMENT is similar to that of "seedy-toe." The affected horn at the coronet should be kept closely pared down. Paraffin oil is a good dressing.

Navicular Disease.

NATURE AND PROGRESS.—This disease (Figs. 67, 68 and 69) probably begins as inflammation of the navicular bone, or of the cartilage upon its lower surface. The chronic inflammation set up in the bone produces changes in the substance of the bone, somewhat similar to those of osteoporosis; in fact, we have "rarefying ostitis," in which the affected portion of compact bone is "slightly redder than natural; the openings of the Haversian canals after a time become somewhat increased in size, and consequently a larger number are visible to the naked eye. As the process advances, the Haversian canals increase at the expense of the bone surrounding them, and when they reach a sufficient size they can be seen to contain a small quantity of pink granulation tissue surrounding the vessel. If a portion of the bone at this stage be macerated, it presents a porous, spongy appearance." *(Erichsen).* Here we have a case of what we may call *caries.* If pus be present, we shall have ulceration of bone. Owing to the presence of inflammation in the substance of the bone or in the cartilage, small nodules, with or without ulceration, form on the lower surface of the navicular bone, over which the perforans tendon plays, and there is destruction of the cartilage of the joint. Apparently owing to the roughness of the once smooth gliding surface, inflammation is set up in the opposing portion of the perforans tendon, and in the synovial bursa, which lies between the tendon and the affected surface of bone, so that the tendon, in old cases, becomes more or less worn through. In the further progress of the disease, the weakened navicular bone may become fractured by the pressure of the tendon on its lower surface; the tendon may fray out to such an extent that it will break in two; it may become adherent to the navicular bone; or the abraded portion of tendon may continue to work over its rough pulley with great discomfort to the animal, which in any case will suffer more or less pain from movement. Naturally, a long rest will favour union between the diseased bone and the abraded tendon.

The (lower) surface over which the perforans tendon plays, is the only surface of the navicular bone which becomes affected in this disease. The other two surfaces, which form a joint with the pedal bone and short pastern bone (Figs. 61 and 70) always remain free from morbid change brought on by this malady.

On referring to Fig. 70, we see that the perforans tendon is attached to the base of the pedal bone, and passes behind the navicular bone, which forms a pulley for it. On leaving the navicular bone, this tendon passes behind the pastern, fetlock joint, suspensory ligament, and knee, and is, finally, united to the muscle, by the contraction of which the foot is flexed. A horse affected with navicular disease is said, in stable parlance, to be "groggy."

PREDISPOSING INFLUENCES.—1. *A naturally weak or defective condition of bone*, in the production of which the influence of heredity is well marked.

2. *Altered nutrition of the bone due to chill* from the practice of standing on cold stones. This supposition seems, as pointed out to me by Colonel C. Phillips, A.V.D., to be borne out by the fact

Fig. 67.—Caries of the navicular bone (navicular disease).

Fig. 68.—Lower surface of pedal bone, showing attachment of perforans tendon, which goes over the navicular bone.

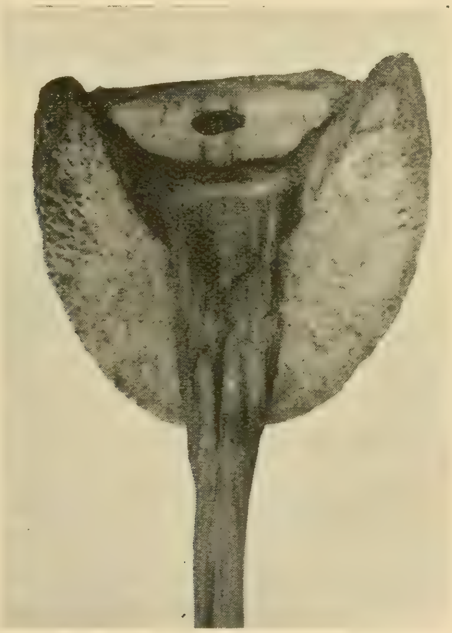


Fig. 69.—Lower surface of pedal bone, with perforans tendon turned back, so as to show caries of navicular bone.

that a comparatively large number of troop horses in England are annually "cast" for this complaint, which, in these instances, is apparently brought on by the not uncommon practice, in cavalry stables, of keeping the horses standing, the greater part of the day, on bare stones, with not much more than an hour's exercise in the twenty-four; while the ground upon which they parade and drill

is usually hard. We may easily understand that the effect of this continued standing on a cold surface which is a good conductor of heat, is to lower the vitality of the living structures of the feet, and to predispose them to become injuriously affected by subsequent concussion. In India, on the contrary, where troop horses are accustomed to stand on earth, and not on stone, and where the ground is much warmer, navicular disease is far more rare. Cab horses, which are particularly liable to this malady, have, as a rule, to do all their standing, when outside, on stone, or on metalled roads. These facts suggest the advisability of providing, when practicable, a bad conductor of heat, such as wood, for horses to stand on, instead of stone, as, for instance, on cab-ranks.

Although long-continued standing is very apt to produce laminitis, it does not seem capable, of itself, to give rise to navicular disease; whether the animal stands on a bad conductor of heat, as he usually does on board ship; or on a good one, like wet soil, as is often the case with farm horses.

3. *Trotting.* I am strongly inclined to think that giving a horse his work—supposing it to be severe or ill-arranged, and the ground hard—at the trot, predisposes him to navicular disease; because the animals which most frequently contract this disease, do their work at that pace.

An upright and concave form of foot, with strong heels, is usually supposed to be conducive to navicular disease. As this conclusion has, I think, been arrived at in most cases, after the complaint has become fully manifest, and as the peculiar gait of navicular disease induces the shape which in popular opinion confers liability to this ailment; I do not think this supposition can be accepted without further proof.

ALLEGED CAUSES.—Those usually advanced by veterinary authorities are: 1. Concussion. 2. Sprain of that portion of the perforans tendon which passes over the navicular bone (*Dick*). 3. The employment of high heels or calkins (*Williams*). 4. Compression, "through the weight of the body on one side, and the pressure of the perforans tendon on the other" (*Fred Smith*). 5. Rheumatism. 6. Heredity. 7. Direct injury from stones, nails, etc., "picked up" by the feet.

1. *Concussion.* When we have to decide between the respective claims of a number of alleged causes of a disease, it is but reasonable to give priority to the one which is found, most commonly, to affect the sufferers. Harness horses which are used for quick road work, are, above all other classes, peculiarly subject to this disease; and owing to the nature of their labour, are proportionately exposed to the ill effects of concussion on

their feet and legs; their feet being especially liable to navicular disease; and their legs, to splints. Stewart, in his "Stable Economy," remarks that: "Long journeys, at a fast pace, will make almost any horse groggy. Bad shoeing and want of stable care both help; but I am nearly sure they alone never produce grogginess. The horse must go far and fast; if his feet be neglected, or shoeing bad, a slower pace and a shorter distance will do the mischief; but I believe there is nothing in the world will make a horse groggy except driving him far enough and fast enough, to alter the synovial secretion of the navicular joint. Cart-horses are quite exempt; horses working in the omnibuses about Glasgow, always on the stones, and often at ten miles an hour, but never more than a mile without stopping, are nearly

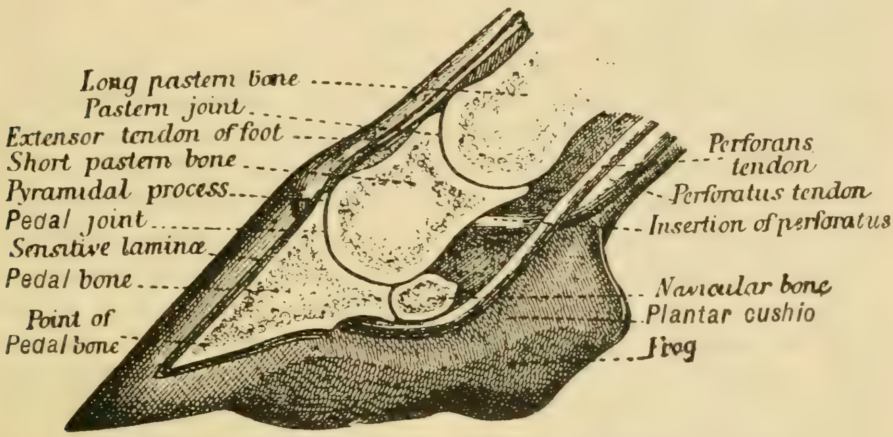


Fig. 70.—Vertical and longitudinal section of horse's foot.

exempt. The horses most liable are those which work long and fast stages." "Stonehenge," also, justly observes that "many tolerably confirmed cases of navicular disease may, therefore, be hunted, except when the ground be hard, supposing, of course, that they are kept off the road; but no plan of management will enable them to bear the jars incidental to harness work or hacking." I think that men of experience will bear me out in saying, that the cab horses—which furnish the highest percentage of sufferers from this complaint—of places in which the roads are laid down with paving stones, are much more subject to navicular disease, than are similarly employed animals in parts where the "going" is smoother, softer, and, consequently, less productive of concussion.

2. *Sprain of the perforans tendon* at the point at which it passes over the navicular bone. The fact that the perforans tendon of the hind limb enjoys no special immunity from sprain, taken conjointly with the fact that navicular disease is of extreme

rarity, behind, in comparison to its frequency in front, proves almost conclusively that the production of this malady by sprain of this tendon is an accident which very seldom takes place. I have never seen or heard of a single case of *post-mortem* examination which showed the existence of sprain or laceration of the portion of the perforans tendon that works over the navicular bone, and which also showed that the navicular bone was in a healthy state; but I have met with several cases of recent navicular disease which, by examination after death, disclosed a diseased condition of the navicular bone without the tendon or synovial bursa being affected in any way. I therefore submit that the foregoing considerations demonstrate the fact that, in the vast majority of instances, the starting point of navicular disease is in the bone or in the articular cartilage which covers its lower surface, and not in the tendon or bursa.

3. *Employment of high-heeled shoes or calkins.* This alleged cause may be dismissed; for were it valid, we should find that the animals which are most commonly shod with calkins—namely, heavy cart-horses—are those which are peculiarly liable to the disease in question; a supposition that is absolutely incorrect. Again, were the practice of using high heels or calkins to blame, we should certainly have many more cases of this malady in the hind feet, than the two isolated instances (p. 211) met with in many thousands, especially as horses are almost always shod higher behind than in front. Besides, a horse suffering from navicular disease "goes on the toe" as a rule, which is a style of progression he would hardly adopt, if the disease had been brought on by identically the same course of action (raising the heel from the ground) by which he now strives to relieve the inflamed parts from pain. Also, a horse thus affected, almost always goes better in a high-heeled shoe, than in a low-heeled one; because, raising the heel tends to flex the pedal joint, and, consequently, to relieve, to some extent, the inflamed structures from the painful pressure of the perforans tendon.

4. *Compression.* The degree of compression on the navicular bone is affected by the rate of speed, and by the weight of the rider or of the conveyance; but not by the nature of the ground. Consequently, if compression was the chief cause of this disease, racehorses, chasers, hunters, and heavy cart-horses (especially those which wear "toe pieces" to their shoes) would be the chief sufferers. On the contrary, they are all but exempt!

5. *Rheumatism.* Beyond the supposition that chill, as we have seen (p. 207), has a predisposing influence, I know no argument which would support the theory that rheumatism can originate this disease.

6. *Heredity,* no doubt, has a strong predisposing influence; but I have met with no proof that, of itself, it can produce the disease.

7. *Direct injury* may, in some rare instances, give rise to this malady. Its influence must be extremely small, considering that only two cases (see next paragraph) in the hind feet have been reported.

SPECIAL LIABILITY OF THE FORE FEET TO NAVICULAR DISEASE.—The extraordinary difference in this respect between the fore and hind feet (according to Möller, only two cases having been recorded) cannot be accounted for by the fact which Col. F. Smith puts forward, that horses, when standing, are accustomed to rest their hind limbs, alternately, while remaining "level" in front; because, as I have already remarked, long-continued standing (of, for instance, from one to four months on board ship during sea voyages) appears to have no influence in setting up navicular disease; although it is a very potent agent in bringing on laminitis. Taking into consideration the large part played by concussion in the production of navicular disease, I am convinced that the difference in liability is chiefly, if not wholly, due to the fact that far more concussion falls on the fore feet than on the hind feet.

SYMPTOMS.—By actual examination of the foot, an observer will discover little to indicate the nature of the ailment; though he may guess at its existence from the absence of signs of other diseases. The peculiarity of the animal's gait, and the manner in which the horse "points," will tend to confirm his supposition. In old cases, there is often contraction, at the heels, of the affected foot or feet. Mr. Harold Leeney, M.R.C.V.S., regards a shrunken condition of coronet as characteristic of navicular disease. In laminitis, the opposite condition, namely, fulness, is generally to be seen in the affected coronet.

As a rule, the horse, in this disease, "points" by placing his toe on the ground, raising his heel, and rounding his fetlock joint. Sometimes, even in advanced cases, he does not point.

The horse, generally, unless the case be bad, walks sound, though when trotted he goes "short," "daisy cuts," and "digs his toes into the ground;" the result of this last mentioned habit being, especially if only one foot is affected, that the toe of the shoe gets worn in a marked manner. Percivall observes that in trying to save the heel, the animal turns the toe in.

There are fewer cases of lameness from navicular disease now than formerly, apparently from the following reasons:—(1) veterinary surgeons perform neurotomy more frequently; (2) fewer

mares which have become incapacitated from this disease, leave town alive; (3) knowledge among breeders has increased; and (4) wood pavement, asphalte and macadam have to a considerable extent replaced the use of paving stones in streets.

Travelling over hard ground greatly affects a horse which has navicular disease, particularly, when he has a heavy weight on his back; although probably he will be able to go free and well through plough or on other soft "going." He is usually a bad stumbler on account of being afraid to raise his feet to a proper height, and to throw a due amount of pressure on his heels. The lameness wears off to a great extent during exercise, which of course affords only temporary relief. In the very early stages, the horse may work lamer.

The disease is generally insidious in its approach, there being often nothing to mark it, further than that the horse commences the habit of "pointing" in the stable; begins to go a little short; or becomes slightly lame now and then. The owner should not be misled by the lameness working off, but should put the case under treatment without delay; for it will prove incurable if allowed to get beyond an early stage.

TREATMENT.—Treatment is but of little avail in this disease, after it has become fairly established, in which case, neurotomy (p. 669) is the best palliative. In the first stages, it is well to remove the shoe, and if necessary rasp down the walls and heels so as to obtain frog pressure. We may give a dose of physic, and feed on green food. If there be a running stream at hand, we may make the horse stand in it for a couple of hours, two or three times a day; care being taken that the part of the bed of the stream on which he stands is soft, and that he has soft ground to walk upon, both going from and returning to his stable. Earth can be used for bedding; as it will tend to keep the feet cool. He may be put in a darkened stall by himself, so as to encourage him to lie down as much as possible, which a horse that is affected by this disease is usually inclined to do. If a stream be not of ready access, buckets of cold water can be used for him to stand in. After a fortnight we may apply to the coronet a mild biniodide of mercury blister, say, 1 to 16 of lard. Turning the horse out into a grass meadow for some time will often be of benefit. The good effect of all this treatment is transient as a rule.

PALLIATIVE SHOEING.—In confirmed cases, use shoes with a broad, flat bearing surface, thickened heels, and the toes turned up on the ground surface, but flat on the foot surface (Fig. 71). With this form of shoe, the foot surface of the shoe will bear on

the sole as well as on the wall, and the concussion caused by the horse striking his toe into the ground will be diminished, as much as possible, by the shock being distributed over the broad, rounded surface of the toe of the shoe.

Horn Tumour (*Keratoma*)

is a new growth of horn which, according to Möller, may begin in the coronet or in the sensitive laminæ. It takes up its position

Fig. 71.—Shoe with toe turned up on ground surface, but flat on foot surface.

between the wall of the hoof and the pedal bone, in which an excavation is made, in course of time, by the pressure caused by its presence interfering with the nutrition of the bone at that part. It is, as a rule, found at the toe, and is not always accompanied by lameness. If the sole be pared, in a case of horn tumour which has been formed by the sensitive laminæ, the white line which marks the union of the wall and sole on the ground surface of the foot, will be found to curve inwards at a point immediately underneath the tumour; the reason being that the white line which in health marks the surface of union between the wall and sensitive laminæ, is, in a horn tumour, the inner boundary of this

new growth. The tumour, which is usually slow in its course, may be accompanied by the formation of pus, which, by reaching the coronet, may give rise to a quittor. Mr. Wild M.R.C.V.S. ("Veterinarian," January, 1894) describes a horn tumour which he extracted from a horse's foot, as a piece of dark-coloured horn somewhat resembling a horse's incisor tooth, with the crown pointing downwards, and weighing about three drachms. It is instructive to note that the development of the teeth closely resembles that of horn, hair and cuticle (scarf-skin or outer skin); all being forms of epidermal growth (p. 154).

The CAUSE is generally injury, as for instance "tread" when the growth has begun at the coronet; or the act of hammering down clinches of the nails or clips of a shoe; or puncture of, or pressure on the sensitive laminæ by an ill-directed nail.

The usual SYMPTOMS are: lameness, which may come on very gradually; pain on tapping the part; and local heat. Signol ("Aide-mémoir du Vétérinaire") remarks that the lameness of a horn tumour at the toe is similar to that of chronic laminitis. I have observed in a horse I treated, the fact remarked on by Möller that if the tumour begins at the coronet, it will usually cause the horn of the wall which covers it to bulge outwards.

TREATMENT.—Cut down on the tumour from the outside of the wall of the hoof; poultice the part for two or three days; remove the tumour with a pair of pincers, aiding the operation with the knife; and treat the wound antiseptically (p. 69). If the bone be affected, it may have to be scraped to remove any dead parts. The cavity may be dressed like that of seedy-toe (p. 202). Möller states that the disease is very liable to recur.

Wounds and Bruises of the Coronet.

These injuries generally appear in the form of "tread," which is the term applied to a wound inflicted upon the coronet of one foot by the other fore or hind foot, as the case may be. The usual causes of tread are: weakness; fatigue; over-taxation of strength; and carelessness in turning the animal, especially when he is in heavy draught, and when he has been shod with "roughed shoes." Tread is principally confined to cart-horses. The more forward is the injury to the coronet, the greater will be the danger of hurting the extensor tendon of the foot and the joint formed by the pedal bone and the short pastern bone. We may note that the extensor tendon of the foot runs down the front of the pastern and is inserted on the upper and front portion (pyramidal process) of the pedal bone (Figs. 5, 7 and 70).

TREATMENT.—If the wound be slight, apply a little tincture of myrrh or arnica. The spirit on evaporating will leave a thin resinous coating, which will effectually exclude the air. Or put on burnt alum, resin ointment, or a saturated solution of camphor or of iodoform in turpentine. If the tread be severe, remove all loose ends, bathe the part in warm water and apply tannoform, creolin (1 to 20 of water), or some other suitable antiseptic (p. 67). If the wound begins to suppurate, poultice for a day or so, but do not continue poulticing so long as to lower the vitality of the structures. If, after this, the sore does not assume a healthy appearance, apply a fly blister round its edges to stimulate the part to healthy action, and continue to treat antiseptically. The blister may be repeated. A neglected tread is very apt to run into a quittor.

Pricks in Shoeing

are caused by nails actually penetrating the sensitive parts, or by their being driven too "close." Pain and lameness may become manifest immediately after the accident, or may not appear until next day, or even for a fortnight or longer, during which interval pus (matter) forms. It may happen that while a nail is being driven, it may split into two branches, one penetrating the sensitive structures, the other passing through the wall in the usual manner. This accident, which was not uncommon when nails were hand-made, hardly ever occurs with good machine-made nails. It is probable that pricks in shoeing are most frequently caused by the point of a nail which, in the act of being driven, comes in contact with the concealed portion of an old broken nail. Hence, before putting on a shoe, all good shoeing smiths are most careful to see that no "stubs" of this kind are in the wall of the hoof. The injury done by "drawn nails" is generally more serious, and always more difficult of detection and treatment than when the offending nail has been left in. A "drawn nail" is the term used to denote a nail which, in the first instance, has been driven in a wrong direction, and then removed. As a shoeing smith who pricks a horse is almost always held in a court of law to be liable for any damage therefrom ensuing, notwithstanding proof of the exercise of all reasonable care and skill; we may take for granted that the man who inflicted the injury, whether carelessly or by pure accident, is not the best person to conduct the practical investigation of the hurt foot. It is evident that the thicker and broader a nail is towards its pointed end, the more liable it will be to lame a horse, if driven close, and as a nail, when in use, is apt to break only at a point close to its entrance into

the wall of the hoof; we may conclude that the thin end should have no more substance than is necessary to afford its clinch a secure hold. The happy medium between undue substance and undesirable weakness is attained, as a rule, only by machine-made nails of a good pattern. Some horses are especially liable to get pricked on account of the walls of their hoofs being abnormally thin. Others are equally or even more apt to suffer from this injury by reason of unsteadiness while being shod. As the wall of the hoof diminishes in thickness from the toe to the heels, and as it is thinner on the inside of the foot than on the outside (Fig. 72); the nearer to the heel a nail is driven, the greater the danger of pricking the horse; and a horse is more apt to get pricked on the inside heels or quarter than on the outside.

Horses which have "worn" fore legs sometimes go lame soon after being shod, on account of their heels having been unduly cut down, and increased strain being, thereby, thrown on the ligaments and flexor tendons of the legs. This form of lameness may easily be mistaken for that arising from a prick in shoeing.

MODE OF DETERMINING THE SEAT AND EXTENT OF THE INJURY.—If the horse, on the nail being driven, flinches evidently from pain, and thereupon goes lame, we may conclude that he has been pricked; especially, if the point of the nail has not come out, or has appeared high up on the wall; or if we have had reason to suppose, from the dull sound of the hammer, that the nail has penetrated the quick. The appearance of blood, on a nail being withdrawn, will also be clear proof of this accident having occurred. If lameness be observed after the nails have been driven, we should first of all see if any of them have been driven "higher" or "coarser" than the others, due allowance being made for their position as regards their respective distances from the heels, at which part, the wall is thinner and more upright than at the quarters, or toes. As advised by Solleysel, we may then take up the lame foot, and tap lightly with the hammer round the opposite one, to see that the horse does not flinch from "fidgetiness." Having ascertained how he "stands" this being done, we should put down the lame foot, take up the sound one, and tap with the hammer on each of the clinches of the nails of the injured hoof, and also on the wall below the clinches, in order to ascertain the seat of pain. If any doubt remains, we should take up the lame foot, and try to find out the tender spot by pinching round the crust with a pair of pincers, one claw resting against the sole within the inner edge of the shoe, while the other presses against the wall. This latter operation may be repeated when the shoe is off. On removing

the shoe, the nail or nails which are near the suspected spot should be examined, and if the injury is of some days' standing, we may detect the offending nail by observing that it is wet, which fact will indicate the formation of matter; or by noticing the existence of a stain round the nail-hole on the ground surface of the horn after the sole has been pared. On withdrawing a nail, such a flow of matter may take place that no doubt can

Fig. 72.—Horizontal section through near fore hoof; showing that the wall is narrower on the inside than on the outside of the hoof.

exist as to the cause of lameness. If the puncture be quite recent, it is possible that no fluid may have escaped into the hole made by the nail. The presence of heat in the hoof at any particular spot will also aid us in our search. Having fixed on the puncture, we should endeavour to pare it out; for if this be not done, a quittor will probably be the result, owing to the matter which forms, not being able to find vent, except at the coronet. The usual manner in which the excavation is made, is to pare out

the puncture with a fine searcher from the ground surface, taking care to keep away from the sensitive parts so as to avoid injuring them; for if they bleed, it will be almost impossible to follow up the course which the nail took. When the point of the offending nail, however, has come out through the wall, I prefer cutting, with the searcher, from the outside, straight down on the passage which the nail has made, than to excavate it from the ground surface; for, by the former plan, there is a minimum of horn removed; the risk of getting too close to the sensitive structures is avoided; and the injured part is left exposed for the application of suitable remedies: conditions which are not obtained by the latter method. We can cut down on the nail before removing the shoe; but if the nail has been pulled out, a piece of wire or a thin nail may be passed through the hole to act as a guide. In deciding which of these two methods it is best to adopt, the temporary question of appearance must be taken into consideration.

Peuch and Toussaint remark that the colour of the pus (matter) found in the puncture may be black, yellow, yellowish-red, or purple. The black colour indicates that the wound is only superficial, in which case, when vent has been given to the matter, the pain resulting from the compression on the sensitive parts, will disappear; and that recovery may soon be expected. The yellow, or yellowish-red colour points to a more serious injury. But if the discharge is of a purple colour and putrid smell, we may conclude that death of some of the soft parts and of a portion of the pedal bone has commenced, and that there is probably, also, fracture of the pedal bone. The presence of a portion of dead bone in the part may be known from the fact of the discharge tingeing a silver probe black, by the formation of sulphide of silver. Our surmise as to the existence of some very serious injury within the foot, will be placed beyond all doubt, if, after the puncture has been pared out and vent given to the matter, the animal still continues to suffer great pain.

TREATMENT.—If the lameness is slight, we may conclude that it is due only to the nail having been driven too "close," in which case the shoe should be removed; the nail-hole filled with an antiseptic, such as turpentine; and the horse rested for three or four days, for the lameness to pass off. If the lameness continues, or if, in the first instance, it is in an aggravated form, we should open out the puncture in the manner already described, and should apply some suitable antiseptic, such as turpentine. Or we might place the foot in a solution of 1½ oz. of Jeyes' Fluid (creolin or carbolic acid), or 2 oz. of sulphate of copper, to a

quart of water. The horse can stand in this for from half an hour to an hour. These baths, which are very highly spoken of, may be continued for several days. In these cases, our treatment should naturally be based on drainage and disinfection carried out as completely as possible. If the inflamed sensitive tissues bulge out into the excavated cavity, they should not be cauterised; for they will regain their proper size when the inflammation subsides. For treatment of fracture of the pedal bone, see page 305.

For constitutional treatment, if the pain be great, give $1\frac{1}{2}$ pint of linseed oil, as a drench, and $\frac{3}{4}$ oz. of nitre, daily, in the drinking water. The animal should be kept on laxative food. If the pain continues to be excessive, give $\frac{1}{2}$ oz. of chloral hydrate in a pint of water, as a drench.

RESULTS.—In case of puncture which involves the pedal bone, death from the consequent pain and inflammation may not improbably ensue, unless the part be well and promptly opened out. If this be not done, even a slight prick of the sensitive tissues, followed by suppuration, will be likely to give rise to quittor.

Wounds of the Sole and Frog

are occasioned by "gathered" nails, pieces of broken glass, stumps of wood, sharp stones, etc.

It often happens that when the offending substance has wounded the foot by penetrating the cleft of the frog, an inexperienced observer will imagine that the tendons or ligaments have been sprained, on account of the effects of the inflammation extending up the leg. This swelling requires no treatment; for it will subside as the inflammation in the foot abates.

The frog, owing to its greater softness, is more vulnerable than the sole. The most dangerous part for a puncture proceeding upwards from the ground surface of the foot, is the region of the navicular bone, which lies directly above the centre of the frog. The navicular bone makes a joint with the pedal bone and short pastern bone (Fig. 70), and forms a pulley for the perforans tendon, between which and the navicular bone, a synovial bursa is placed for lubricating purposes. Hence a puncture in this part may wound the perforans tendon, the bursa, the navicular bone, and the joint, and may extend even further up. Wounds towards the point of the frog may cause fracture or chipping of the pedal bone. Even without involvement of bone or tendon, very severe inflammation may occur by puncture of the deep-seated sensitive tissues of the frog (plantar cushion, Fig. 70)

from the pus (matter), which can hardly fail to form, not obtaining an efficient exit. In all these serious cases, there will be great pain and high fever. If the navicular bursa or joint be opened, there will be a discharge of synovia, tinged with blood, which discharge will soon become dark and stinking.

Tetanus (p. 527) is not an unfrequent result of wounds of the sole and frog, which consequently should be treated antiseptically, so as to destroy, or, at least, to prevent the development of any of the microbes of this disease that may be present.

TREATMENT.—Remove any foreign bodies; and treat as for "Pricks in Shoeing" (p. 218). My readers will find in Möller's "Veterinary Surgery" a very able description of the operation necessary when the perforans tendon has become diseased from puncture.

PREVENTIVE MEASURES.—On no account thin the sole or pare the frog, except to remove loose or undermined parts; and allow the foot to retain its natural protection. Do not use "stoppings," which will make the sole and frog soft and spongy.

Corns.

DEFINITION.—A corn is a bruise of the membrane which secretes the horny sole and which covers the ground surface of the pedal bone.

NATURE.—That portion of the sole which lies in the angle formed by the wall and bars, and which is called the "seat of corn" (Fig 73), is the spot which is peculiarly liable to this injury, because the sole is thinnest there; the horse, in all his paces, places his heel first on the ground; and the sensitive sole is apt to be pressed upon at that part, by the horn of the wall, in the event of the heels being allowed to grow too long, especially if the bars have been cut away.

LIABILITY.—The chief predisposing causes of corns are weak heels and flat soles; fast work on hard ground; and bad shoeing.

POSITION.—Although corns occur frequently in the fore feet, they are rarely found in the hind ones; the reasons being that the latter are far less exposed to concussion than the former; their soles are, naturally, more arched, and, consequently, are less exposed to injury; the heels are stronger, and as a rule

are not lowered so much in shoeing as the heels of the fore feet. The fact that corns occur much more frequently on the inner heel, than on the outer, is usually accounted for by the supposition that more weight is thrown on the inner than on the outer side of the foot; but the general custom of shoeing horses very "close" on the inside heel, is, I think, much more to blame. This liability may also be influenced by the more perpendicular position of the wall of the inside of the hoof, and by the fact that the wall of that side of the foot is weaker than that of the outer side.

CAUSES AND PREVENTION.—The chief cause is a faulty system of shoeing, by which pressure becomes applied to the

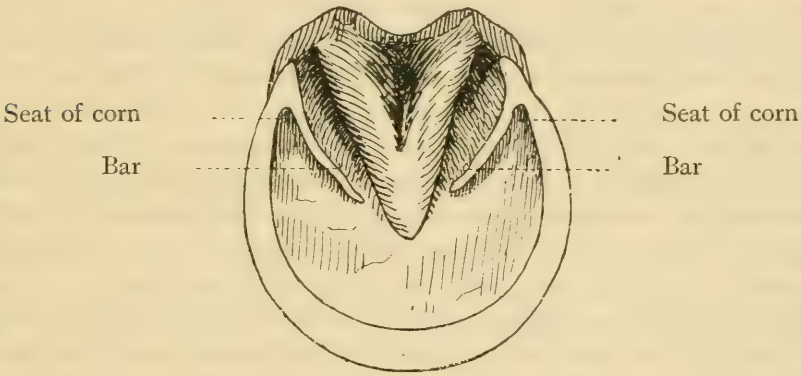


Fig 73.—Ground surface of horse's foot.

"seat of corn." The common and pernicious practice of cutting away the bars, undoubtedly, disposes the foot to contract this ailment; for the wall at the heels, when it loses the support afforded by the bars, is apt to bend inwards and to press on the seat of corn. It sometimes happens that, when "preparing" the foot, the smith rasps down the wall at the heels without also reducing the horn over the seat of corn, which then bears the greater part of the pressure, with the natural result of this injury. Again, when the heels of the shoe are "sprung," that is, when a space is left between them and the horny heels, grit and particles of stone are apt to work in between the web of the shoe and the "seat of corn," and, consequently, to hurt the latter on account of its being constantly hammered upon by the former, whenever the animal moves.

The principal manner, however, in which horses get corns from shoeing, is undoubtedly the practice adopted with hunters and other saddle-horses, of having the shoes on the fore feet short

at the heels, and of making the outward edge of the inner heel of the shoe to coincide with the outward edge of the wall of the hoof at that part, or even "set" slightly inside it. Here, although the position of the shoe is perfect for the time being; it does not allow for the continued opening out and lengthening which the heels undergo during the downward growth of the hoof. Consequently, when a shoe is applied in this way, and is allowed to remain on, say, for six weeks, the heels of the shoe, instead of exactly covering those of the foot, will be found to be a little within their outer margin and somewhat in front of their rearmost point. As the horn of the ground surface of the foot is hardest on the outside and at the extreme end of the heels; the heel of the shoe in the case just described, will, as a rule, be more or less embedded in the comparatively soft horn invaded by it, with the probability of a corn being formed. As regards keeping the heels of the shoes of the fore feet short, those of us who ride or own 'cross-country horses, are impaled on the horns of a dilemma: one being the risk of a corn; the other, that of the shoe being pulled off by the hind foot, especially, when jumping and even galloping on heavy ground. As the latter danger admits of no escape; we must face the former, which we can prevent by frequent shoeing, say, at least once a month. As a horse does not brush with the heel of a foot, but with its quarter; I would advise that when a horse is shod, the outer edge of the inner heel of the shoe of a fore foot should be fitted so as to slightly project outside the wall. When shoes are kept on an inordinately long time, the web of the shoe, generally at the toe, may become so thin, as to cause the shoe to get out of shape and press on the spot which is most liable to corn.

The use of calkins may cause corns by localising, on the heels, the effects of concussion with the ground. In some rare cases, corns are produced by the horse treading on a stone or other hard body, which is a result that will very seldom occur if the sole be not "thinned." When the ground surface of the foot has been reduced too much, the sole may become bruised at any part pressed upon by the web of the shoe, especially, if the animal is worked at a fast pace and on hard ground. As previously mentioned, some horses have such weak feet that it is almost impossible to prevent them getting corns by any system of shoeing; for in their case, the concussion produced by the iron on the wall of the hoof at the heels, appears, when the animal is worked on hard ground, sufficient to set up an irritable state in the seat of corn, which condition will be manifested by more or less lameness, even when the characteristic red mark in the horn is not present.

Narrow-heeled shoes which rest only on the wall at the heels,

although recommended by some for the prevention of corns, are not, as far as I have seen, efficient for that purpose; for, by taking off the pressure on the bars, they throw too much weight on the wall, and hence are liable to set up irritation in the sensitive sole at the angle between the wall and the bars. If an ordinary shoe is used, the web of the shoe at the heels should be broad, so that the concussion received from the ground may be distributed over a large surface. In all cases, the bars should be preserved intact. If the animal is peculiarly liable to corns, the seat of corn may be slightly eased off. Horses which go barefoot, or which are shod with tips, hardly ever get corns.

As a preventive measure, the feet should be kept dry, and no "stoppings" should be used; for moisture softens the sole and renders it liable to injury and putrefaction.

LAMENESS RESULTING FROM CORNS.—Corns do not always produce lameness. When a horse goes lame from this cause, he "works" worse and worse. If, however, he gets a rest for a day or two, the lameness may disappear for the time being.

When a horse suffers from a corn, he may "point." If both fore feet are affected, he may show uneasiness by frequently changing the position of his feet.

THE DIFFERENT DEGREES OF CORNS.—(1) The simplest form of corn, according to H. Bouley, is when the sensitive sole, immediately above the seat of corn, is in such an irritable state from pressure or concussion, that the horse goes lame; although, on paring out the part, no alteration in the colour of the horn can be perceived; increased sensibility being the only symptom. (2) In the next degree of corn, some of the small blood-vessels of the sensitive sole become ruptured, and, consequently, blood escapes from them into the rudimentary horn which has been newly secreted, and which, on becoming pushed downwards by the continued formation of new horn, dries and hardens, while still retaining the characteristic stain from the blood. If on paring out the corn, the discolouration appears only on the surface, we may conclude, provided the animal goes sound, that the injury is of a passing character; if only close to the quick, that it was recently inflicted; if the stained horn is in layers with unaltered horn between them, that it was repeated on different occasions; and, if the whole of the horn down to the quick be discoloured, that the source of irritation was of a continued nature. (3) When the inflammation has been so severe as to set up a certain amount of inflammation short of suppuration taking place, a watery exudation filters through the horn below the injured spot, render-

ing it wet, especially, close to the sensitive sole, and tingeing the neighbouring horn with a more or less yellow colour. (4) The most serious form of corns is when suppuration (the formation of pus) takes place; for, in this case, unless the part be opened out, the constantly increasing matter will force its way up to the coronet, as that will be in the direction of the line of least resistance, and will, consequently, produce a quittor. It may, also, cause disease of the lateral cartilages, or even of the pedal bone. Such complications may be so grave as to threaten the life of the animal.

GRAVITY OF CORNS.—Owing to their tendency to persist and recur, corns are a serious form of unsoundness, especially when the feet are predisposed to this ailment, by their conformation.

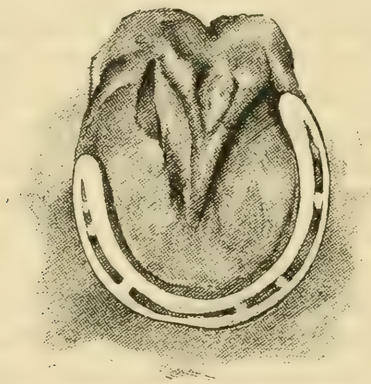


Fig. 74.—Three-quarter shoe.

TREATMENT.—Remove the shoe. Pare out the seat of corn to see if there be any suppuration; but do not remove more horn than is necessary for this object; because it would be injudicious to deprive the sensitive sole of its natural protection without good reason for doing so. If matter has formed, free vent should be given to it, and the foot should be poulticed for two or three days. The part may be stimulated by the application of oil of turpentine. If a suppurating corn does not readily heal, pass a red-hot iron into it and freely burn the diseased parts. If the discharge has a stinking smell, we may conclude that the pedal bone or lateral cartilages are involved; in which case, the part should be opened out, the diseased portions removed, and the wound antiseptically (p. 67, *et seq.*) attended to. If quittor be present, it should be specially treated. After an ordinary corn has been examined, it is well to apply a three-quarter shoe (Fig. 74), or a bar shoe of the form shown in Fig 52 (p. 177), if the frog is strong enough to bear the pressure, so that all weight may be taken off the foot

near the seat of the corn; for no matter how carefully the shoe is applied, the injured part will be jarred if the otherwise unsupported web rests on any part of the bar or wall near the corn. In my own practice, I always use a three-quarter shoe for an ordinary corn, and, as a great rule, find, even when the animal

Fig. 75.—Bar-shoe for foot with corns on both sides.

has been decidedly lame from the corn, that he will go "level" next day, if not immediately after the three-quarter shoe has been put on, and will need no further treatment beyond allowing the corn to grow down, and keeping pressure off the part.

The bar shoe shown in Fig. 75, is excellent for a case in which there is a corn both on the inside and on the outside of the foot.

Quittor (*Fistula at the Coronet*).

DEFINITION, NATURE, AND SYMPTOMS.—A quittor is an abscess consisting of one or more canals which open or tend to open at the coronet and which extend between the wall of the hoof and pedal bone. It appears as a hard, hot, and painful swelling on the coronet, when that part is the seat of the exciting injury. If the cause has been a prick or suppurating corn, it will generally first show its presence by a moist condition of the skin of that part of the coronet through which it seeks an opening. As a rule, a quittor suppurates slowly, and is more painful during its early than its later stages. Its healing is often delayed by the presence in it of a diseased portion of the lateral cartilage of that side, of diseased or dead bone, or of dead fibrous tissue; and by the walls of the sinus, from their proximity to horn-secreting membranes, becoming hardened, in which case they will have to be destroyed by caustics or the hot iron.

VARIETIES AND CAUSES.—We may have quittors originating from (1) injury of the coronet, as from "treads," blows, frostbite, or aggravated sandcrack; from (2) injury of the sensitive sole, as in suppurating corns, in which the pus follows the line of least resistance to the coronet; and from (3) hurt inflicted on sensitive structures between the sole and the coronet, as in pricks in shoeing. When the coronet has been the seat of injury in the first instance, the resulting pus lodges behind the wall of the hoof, corrodes (p. 15) the soft structures with which it comes in contact, and gravitating downwards on being pressed either forwards or backwards, gradually burrows one or more fistulæ or canals inside the wall of the hoof. Quittors are principally confined to heavy draught horses; as these animals, from the nature of their shoeing and work, are much more liable to injuries which produce this affection than are those of lighter breeds. Owing to wounds inflicted by the sharp calkins which are used during frosty weather, quittor is most common in winter.

TREATMENT.—The principles governing the treatment of a quittor are those which are applicable to an abscess (p. 79); always remembering that any dead or diseased structures existing in it, should be removed without delay. If the tumour on the coronet has not "come to a head," we may stimulate it by rubbing into it an ointment composed of 1 part of biniodide of mercury to 4 parts of lard. In case of a deep quittor, it saves time and secures drainage, to convert the sinus into an open wound by cutting

down, from the outside of the wall of the hoof, on the inflamed parts, so as to expose them to view, in order that we may, by means of antiseptic dressings, induce them to heal quickly. Having cast the animal and put him under chloroform, we should cut a vertical opening, through the hoof, just below the quittor, from the coronet to the ground surface of the foot, with a special saw or drawing knife (p. 180); and open up the sinus through the

Fig. 76.—Moment at which clicking takes place.

division in the hoof, by means of a scalpel or probe-pointed bistoury, while cutting outwards. We should then syringe out the abscess with an antiseptic solution (67), and treat it antiseptically. If the lateral cartilage is diseased, it is as a rule best to remove it entirely. This is a serious operation which I need not describe here. When a cartilage is diseased or dead, it will be of a pale pea green or sulphur yellow colour, instead of the white of health. The subsequent treatment will be that of an abscess (p. 79).

Forging or Clicking.

As this habit sometimes causes injury to the foot, and as it may often be remedied by suitable shoeing; it is not inappropriate to consider it from a veterinary point of view, and not merely as a riding or driving vice.

DEFINITION.—Forging or clicking is the act done by the horse, at the trot, when he strikes a fore shoe, or the ground surface of its hoof, with the hind hoof or shoe of the same side (Fig. 76). The term is usually applied to the noise thereby made.

MANNER IN WHICH FORGING TAKES PLACE.—Generally, one of the heels of the fore shoe is hit by the hind foot, as may be proved by the fact that in the majority of cases, a horse which forges will not be heard to do so, if he be shod in front with tips. Also, when instances are noted of the hind hoof being injured by the practice of this habit, it will be found that the front of the hoof, at some spot intermediate between the ground surface and coronet will become, more or less, deeply indented. In some cases, the toe of the fore shoe, at its inner edge, is struck by the toe of the hind shoe.

CAUSES.—(1) Inability to lift up the fore foot quick enough to remove it out of the way of the hind foot. This may be due to an "uncollected" method of trotting, by which the horse throws too much weight on the forehand, which he may do when going either too slow, or too fast; to weakness; to fatigue; or to ill-regulated shoeing. Conformation has a strong influence on the liability of a trotter to forge or over-reach; the animals which are most addicted to these forms of interfering being short in the body as compared to their length of limb, and higher over the croup than at the withers. In fact many of the best American trotters are so liable to strike their fore feet with their hind ones, that they cannot be worked at fast paces without wearing boots which are specially designed for the prevention of such injuries. (2) A vicious habit acquired by the horse, who appears to obtain amusement from hearing the "click, click" of his feet.

REMEDIES.—(1) Preserve the proper slope of the fore feet, by lowering the toes, or raising the heels, as the case may require. This slope should, with ordinary shaped feet, be about 50°. (2) Use tips. (3) If the horse hits the toe of the fore shoes, the use of concave shoes will often stop the objectionable noise. (4) Have

the horse properly broken, and ride or drive him, so that he may trot in a collected and well-balanced manner. (5) If the forging be from weakness, attend to his general health. (6) If it occurs only when the animal is tired, the remedy is obvious. (7) Many American trotting authorities recommend for preventing forging and over-reaching at the trot, the employment of heavier shoes in front than behind; the respective weights being, say, 14oz. and 6oz. for each shoe. The use of heavy shoes will improve the action in front, and may be discontinued after it has affected its purpose.

CHAPTER XI.

Diseases of Bone, Joints, and Cartilage.

General Remarks—Splints—Enlargement of the Splint Bones—Sore Shins—Ringbone—Bone Spavin—Osteoporosis—Rickets—Rheumatoid Joint Disease—Stiff Joints and Knuckling Over—Side Bones.

General Remarks.

Inflammation of bone follows the same course as inflammation in other tissues, allowing for difference in structure. It may originate, as far as I can see: (1) from irritation due to the tearing away of the points of attachment of the bone with tendon or ligament inserted on it; (2) from direct injury, as from blows; (3) from indirect injury, as from concussion; (4) from compression; (5) from changes brought on by chill, which changes are generally ascribed to rheumatism; and (6) from infection. Goubaux and Barrier state that "it is important to remember that tumours of bones which are the results of 'work,' appear only at the points of insertion of the great articular ligaments; because it is at these particular points that strain and distension impressed on the part, spreads to the periosteum and sets up inflammation in it. The irritation extends gradually and soon finishes by invading all the bony surfaces which are covered by these ligaments." This explanation, though undoubtedly correct in accounting for the occurrence of splint, jarde, ringbone, and probably curb, does not furnish us with the cause of sore shins, navicular disease and bony tumours (enlargements) due to blows; for the inflammation in these cases does not necessarily originate at the points of insertion of the ligaments of joints.

We may have the formation of pus on the outside or inside surface of the periosteum (the membrane which covers a bone), or in the substance of the bone. When the suppuration is on the outside of the periosteum, the tissues which cover the periosteum will be swollen and the pus will be watery and more or less tinged with blood. If it be beneath that membrane, the pus may force the thickened and inflamed periosteum away from the bone. If the pus invades the substance of the bone, it will be red in colour and may give rise to death of the invaded portion of the bone by reason of its interference with the local circulation. Whether the pus forms on the inside surface of the periosteum or in the substance of the bone, the bone, if it can be felt or seen, will be found to be swollen and the part extremely painful on account of the resulting pressure on the nerves. In all cases, the pus will corrode the tissues with which it is in contact, and thus will tend to work its way to the surface by gravitation. Any dead portion of bone will in time become separated from the living bone, and will become more or less dissolved by the pus which surrounds it. If we have reason to fear that pus is beginning to form either

in the bone or immediately underneath the periosteum, we should provide for its free exit by means of the knife, and should treat the wound antiseptically (p. 74).

The treatment of inflammation of bone is generally best carried out by severe "counter-irritation," such as firing or sharp blistering. The rationale of this practice appears to be that violent local irritation stimulates inflammation of bone to complete its course. Thus, in spavin it tends to set up bony union between inflamed surfaces of bone which, by pressing against each other, give rise to pain and consequent lameness. In sore shins and apparently in curb, the completion of the inflammatory process seems to leave the bone

Fig. 77.—Splint on outside of off fore.

and its covering membrane (the periosteum) free from any abnormal tenderness. In splints, the removal of pain is no doubt obtained in both ways; for during their formation there is liability of friction occurring between the inflamed surface of a splint bone and that of the cannon bone.

Splints.

DEFINITION.—According to the popular view, a splint (Fig. 77) is a bony deposit which appears on the side of the leg, between the knee or hock and fetlock; but following the teaching of Percivall, it would be more correct to say that a splint is a bony deposit which takes place between the cannon bone and one or both of the splint bones. This connection is well shown in Figs,

78 and 79, especially when they are compared with Fig. 80, which represents a cannon and splint bone free from splint.

PREDISPOSITION.—Evolution plays a large part in the formation of splints, which, certainly, were seldom if ever present in the remote five-toed or even three-toed ancestors of the horse. If we compare our own hand to the lower portion of a horse's fore leg, we shall see that our wrist corresponds to his knee, and our middle finger to his pastern and foot. His ancestral digits (fingers or toes) which would correspond to our thumb, index finger, ring finger and little finger, have entirely disappeared during the course of evolution; and the bones (metacarpal) between the knee and the first digit (thumb) and fifth digit (little finger) have also vanished. The metacarpal bones of his second digit (our index finger) and fourth digit (our ring finger) remain, however, in the more or less decadent state of splint bones.

Splint bones are often called rudimentary bones, but that is an evident misnomer.

We all know that this diminution in the number of the digits of the horse is due to gradual alteration of surroundings. His early ancestors no doubt found an expansive foot of five, or even three, digits, useful for sustaining the weight of their bodies in the more or less marshy ground which these animals inhabited. But as their descendants adopted harder "going" for feeding and roaming purposes, the third digit of all four legs became more useful, with the result of increase in its size, and of diminution in the volume of its fellows.

By an examination of our own hand, we can see that there are muscles which are placed between our metacarpal bones (the bones between the wrist and fingers), and consequently we are able to slightly alter the width of the palm of the hand, and to separate our fingers one from the other, or draw them together. The possible amount of separation of the metacarpal bones and their respective fingers varies in proportion to the distance from the wrist. There is a somewhat similar condition in the metacarpal interosseous muscles of the dog. Decrease of this lateral play (or fanning-out action with the wrist as a pivot) of the metacarpal bones, is accompanied by diminution of the distance at which these bones are apart. This curtailment of space has reached its maximum extent in the case of the ox's third and fourth metacarpal bones, which are fused into the one bone that forms his cannon bone; and a similar condition exists in his hind legs, namely, in his metatarsal bones. At first glance, the cannon bone of the ox might appear to be a single bone, but as Milne Edwards (Gaudry's "Enchainements du Monde Animal") points out, it

consists of two bones (third and fourth metacarpal bones), which are separate during the early life of the foetus, but become united before birth. We may therefore conclude that although the ox cannot now get a splint between his third and fourth metacarpal or metatarsal bones, his ancestors at one period were liable to this disease, from which the horse of the future will no doubt be free.

When the ancestors of the horse were three-toed animals, their

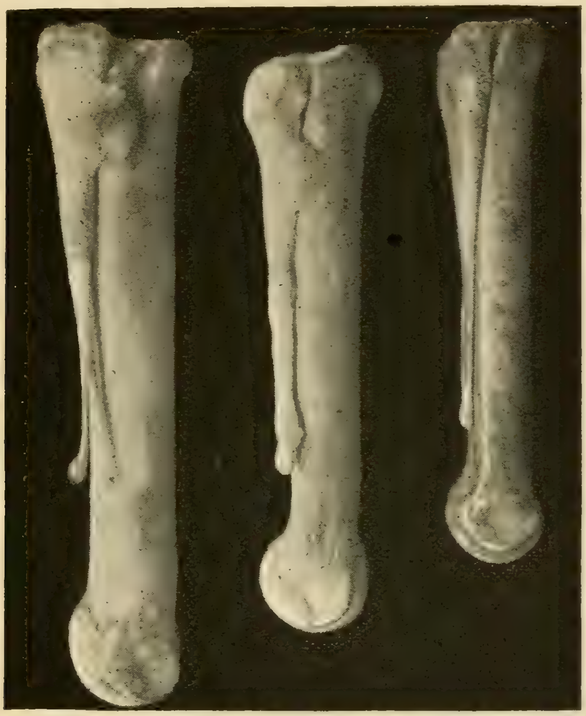


Fig. 78. Splint on outside of off hind.

Fig. 79. Splint on outside of off fore.

Fig. 80. Off fore free from splint.

second and fourth metacarpal bones, which to-day are the splint bones of the horse, served the useful purpose of forming joints with their respective digits. But as these digits have disappeared, the lower portion of the splint bones is no longer useful, and, besides, is often a cause of lameness, on account of its presence giving rise to a splint, or to irritation. The upper portion of the splint bones forms joints respectively with certain small bones of the knee or hock, as the case may be. It is impossible to say with certainty how much of the splint bones of the horse is a useless and undesirable appendage; but to judge by the size of

similar bones in the ox and sheep, we might reasonably conclude that it would be an advantage to the horse if the lower two-thirds of his splint bones were non-existent. Agreeably to principles already discussed, we find that the closeness of connection between a splint bone and its cannon bone decreases from the knee (or hock) downwards. In fact, although the upper end of a splint bone is closely united to the head of its cannon bone, its lower end is generally free.

The foregoing observations tend, I think, to show that partial union of a splint bone with its cannon bone is often a perfectly natural result of increasing years, and cannot, in such a case, be regarded as a disease.

In the course of the evolution of the horse, the second and fourth metacarpal bones, instead of occupying a more or less forward position, as they once did, have gradually taken up their positions at the back of their respective cannon bones; the three bones thus forming a groove for the suspensory ligament, which was once a muscle. This arrangement of the splint bones is a serious predisposing cause of lameness in horses; because a splint, on account of the consequent bony enlargement, would be apt to give rise to painful pressure on this ligament. Hence the advisability, when practicable, of removing the cause of lameness, namely, the offending portion of bone.

The distance of the lower end of a splint bone from its fetlock is a very variable quantity; in fact, the splint bone, on rare occasions, comes down to the level of the fetlock, and is furnished with a pastern and hoof. In "Points of the Horse," I have given a photograph I took of an example of this form of atavism. Although the average curtailment of length of the splint bones meets the requirements of horses at liberty in the open, it is not sufficient for the abnormal amount of concussion which the animal's legs have to endure when trotting on a hard road, or carrying a rider at the gallop, even on soft and elastic turf. Hence, abnormally long splint bones, especially if their respective lower ends are unusually thick, are often predisposing causes of lameness.

I think that the foregoing considerations warrant us in assuming that the frequency of splints (union of the splint bones with their large metacarpal or metatarsal bone) is increasing, and their gravity diminishing in an equal ratio. Age exhibits a similar tendency. Abroad, I have often heard it remarked that well-bred English horses are far more liable to splints than foreign breeds which live in a semi-wild state. Artificial conditions and selection in breeding, when favourably applied, tend to hasten the slow course of evolution.

The heavier a horse's body is, compared to the strength of the

bones of his legs, the more predisposed will he be to develop splints, is an assertion that cannot be gainsaid.

CAUSES.—In young and healthy horses, each of the splint bones is attached to the cannon bone by a strong interosseous ligament, which, with advancing years, tends to become converted into bone. As, in the large majority of cases, bony deposits (with the exception of "sore shins") on the leg between the knee and the fetlock, appear somewhere at the junction of a splint bone and the cannon bone, and as they usually occur during youth, before

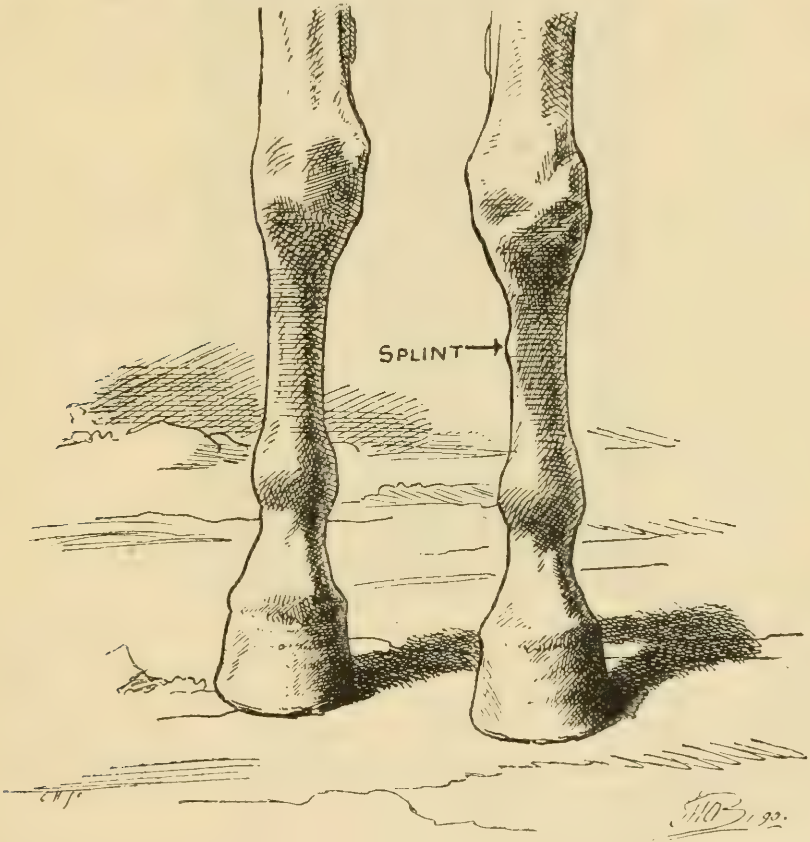


Fig. 81.—Splint on the inside of the near fore leg.

bony union has taken place between the cannon bone and the splint bones; we may fairly surmise that they are brought on in the majority of cases, by inflammation having been set up in the part by sprain of the interosseous ligament. This view is further strengthened by the fact, which I shall presently attempt to explain, of splints occurring more frequently on the inside than on the outside of the leg. This sprain of the interosseous ligament gives rise to inflammation of the periosteum (the covering mem-

brane of bone) with consequent deposition of bony material. When the bony enlargement is confined to the cannon bone, we may take for granted that it has been caused by a blow. Violent shock transmitted longitudinally through the column of bones between the knee and fetlock, is, naturally, the great cause of splints, which consequently often result from fast movement, especially on hard ground. Hence this disease is chiefly caused by trotting on hard roads. It is evident that the higher the action and the heavier the body of the horse, the more liable will he be to get splints. Jumping is also a cause of splint. The more unused a horse is to jumping, the more liable is it to cause a splint; because practice teaches the animal to regulate his movements so as to more or less diminish the disagreeable, if not actually painful effects of concussion.

Splints are to be found on the hind legs as well as on the fore legs; but as the former are much less exposed to the effects of concussion than the latter, splints on them are rarely of serious detriment to the animal. This fact, and the less degree of attention which is usually given to the hind limbs than to the fore, are no doubt the chief causes which make ignorant stablemen frequently neglect to notice the existence of splints on the hind extremities. Fig. 96 shows a splint on the inside of the near hind, and close to the hock; and Fig. 78, one on the outside of the off hind, and also close to the joint.

The absence, as a great rule, of marks of wounds of the skin immediately over a splint on the inside of the leg, leads me to think that a splint (using the term in its ordinary meaning) seldom occurs from a blow with the other fore leg or with a hind leg as the case may be. I am of course aware that a bony deposit is often the result of "speedy cutting;" but English veterinary surgeons do not apply the term splint to it. When the bony enlargement, as I have already said, is due to a blow, it will generally be confined to the cannon bone, and will therefore be more forward than the usual seat of splint.

VARIETIES OF SPLINTS.—Solleysel, followed by Percivall and other writers, divided splints into five classes, viz:—

1st. The simple splint, which is away from the knee, and does not interfere with the tendons and suspensory ligament (Fig. 81). In the majority of cases splints are of the simple form, which, as it occasions but little lameness, is of trifling consequence as far as the usefulness of the horse is concerned.

2nd. The double or pegged splint "occurs when there are two splints, one upon the outer, the other upon the inner side of the leg, directly opposite to one another, as though they were pinned

together through the leg, from which they derive the denomination of pegged" *(Solleysel)*. It is generally thought that a bony communication exists between these "pegged" splints, and that pressure exerted by this bony communication on the suspensory ligament, is the cause of the frequent and often inveterate lameness which accompanies this condition. Actual dissections on the dead animal convince me that such a bony communication between the two splints seldom exists, and that the interference

Fig. 82. Splints.

Fig. 83. Cannon bone without splints.

with the suspensory ligament and consequent lameness are due to the encroachment—from one or both sides—of the bony deposit, on the canal occupied by the suspensory ligament. This lateral encroachment is shown in Fig. 82, which also exhibits a bony deposit at the back of the upper part of the cannon bone, apparently due to sprain of the suspensory ligament, which has a portion of its upper attachment on that spot.

3rd. The splint close to the knee (Fig. 77).

4th. Two splints, one above the other, and on the same side of the leg. This classification is not general enough; for the bony growth may involve the entire splint bone; not only uniting it for all its length to the cannon bone, but also increasing its entire thickness as in Figs. 79 and 82.

5th. A bony deposit involving the cannon and splint bones with those of the knee, with which they articulate. This bony union usually occurs between the head of the internal splint bone and the lower surface of the small bone (the trapezoides) of the knee, with which it forms a joint.

These divisions refer particularly to splints on the fore legs: a limitation which I shall, further on, try to remedy by making some remarks about splints on the hind legs.

I venture to suggest the following classification of splints as being more rational than the one just given:—

(*a*) *Local splint*, which is limited to one spot, and which does not involve the bones of the knee.

(*b*) *Diffuse splint*, as in Figs. 79 and 82.

(*c*) *Splint close to the knee* (Fig. 77), or *knee splint*.

GRAVITY OF SPLINT AS REGARDS VARIETY OF HORSE.—A splint on the leg of a heavy cart-horse is not so objectionable as one on that of an animal employed at fast work, and, especially, at trotting; for concussion is the chief factor in aggravating the pain and lameness of splint. Owing to their unnaturally high action and the nature of their work, hackneys suffer far more from splint lameness, than hunters, chasers, and flat-race horses.

OCCURRENCE OF SPLINT ON INSIDE RATHER THAN ON OUTSIDE OF LEG.—The fact that splints appear more frequently on the inside than on the outside of the fore leg, is usually accounted for by the nature of the conformation of the bones of the fore extremity, in that the internal articulating surfaces of the long and short pastern bones are larger, and are, consequently, more suited to bear weight than the external ones. The consideration of the shape of the foot—the inner quarter of the hoof being more upright than the outer—and the fact that "corns" are much more commonly found on the inside than the outside heel, also strengthen the supposition that more weight is thrown on the inside than on the outside of the leg. Provision being, however, made for this by the articulating surfaces of the former being larger than those of the latter, as far as the fetlock and pastern bones are concerned; I think we must look for some other explanation for the fact of splints occurring more frequently on the inside than on the outside of the leg. A much more feasible one, as given by Merche, is afforded us by the manner in which the lower bones of the knee articulate with the splint bones. On the outside, a small knee bone (the unciform) bears its weight on the outside splint bone and also on the cannon bone; but the inside small knee bone (the trapezoides) rests almost entirely on the inside splint bone. Consequently, the interosseous ligament which binds the inside splint bone and the cannon bone together, would, in the event of the leg sustaining a violent shock, be more likely to become sprained, than that of the outside splint bone.

AGE AS AFFECTING SPLINTS.—Young horses (five years old and under) are most liable to splints; for splints being usually a result of sprain of the interosseous ligament which connects the splint bone to the cannon bone, they are naturally much more

liable to occur while this ligament exists in its entirety, than when, with advancing years, it has become converted, more or less, into bone. As bones in youth are more full of blood than at a more advanced age, when the elements of nutrition are supplied to them by the blood-vessels in a decreased amount; we may conclude that the younger the horse, the greater probability there is of his becoming lame from a splint. Besides, young ones being more awkward, are more liable to "hit" themselves, than are older animals. Old age and a long rest often cause, as may be seen among stud animals, the almost entire absorption of large splints.

HEREDITY.—The influence of hereditary predisposition is well marked. Also, the conformation of the legs induces liability to this disease, especially, when the animal is heavily "topped."

GRAVITY OF SPLINT ACCORDING AS IT IS ON THE INSIDE OR ON THE OUTSIDE OF THE FORE LEG.—A splint on the outside of a fore leg, is generally more serious than one on the inside, especially, if it be well forward, and high up; for it will then be apt to interfere with the extensor tendon of the long pastern bone, which tendon is on the outside of the knee, and goes down the front of the cannon bone (Fig. 7, p. 33).

SPLINTS ON THE HIND LEGS.—In a hind leg, a splint (Fig. 96) may occur on the inside of the leg, from the downward pressure of the small cuneiform bone on the top of the small splint bone.

PROBABILITY OF RECOVERY.—As a rule, rest and time removes the lameness and greatly reduces the size of even very large splints. At the same time, I would not hold out much hope for the permanent recovery of an aged horse which had been lame for a considerable period, or on repeated occasions, from a splint close to the knee, or from splints that involved the two splint bones of a fore leg, and (like those in Fig. 82) caused considerable enlargement through the entire extent of these bones.

SYMPTOMS.—"A splint is detected by grasping with the hand the horse's suspected leg in the ordinary manner in which we feel the leg, and tracing, with the fingers upon one side and the thumb upon the other, the inner and outer splint bones from their heads downwards to their tapering extremities. Any actual exostosis will at once arrest the hand; any rising or irregularity will create suspicion and lead to closer examination" (*Percivall*). Horses, especially young ones which have lately been put to work, not unfrequently become lame from splint before any swelling appears

on the bone. For this reason, in the examination of a case of obscure lameness, especially if the animal be young, we should never fail to look for the signs of splint lameness, namely: that the lameness at the trot is out of all proportion greater than that at the walk; that the animal, usually, fails to bend the knee freely; and that exercise increases the lameness. The last-mentioned condition is also present with corns; but an examination of the foot will determine the question of their existence. Young horses with obscure splints which cause lameness, are sometimes wrongly suspected of having navicular disease. To avoid making this mistake, we should recollect—1st, that the lameness of navicular disease gets better as the animal becomes warm with exercise; and 2ndly, that young horses, say, those of five years old and under, very rarely suffer from it. Some horses, by an unusual development in the size of the inner splint bones of their fore legs, appear, at first glance, to have splints on both of them, although the limbs may be free from any diseased growth of bone. In such a case, the splint bones will feel, to the touch of the fingers, free from any bony deposit. When deciding on such a point, we should carefully observe if the two inner splint bones be of the same size.

If the swelling which causes the lameness in the case of a recent splint be perceptible, there will usually be heat present, and pain on pressure.

When training young horses for racing and steeplechasing—during which process I of course made a daily examination of the legs of my charges—I generally found that splints on the fore legs, before becoming manifest to the touch, have an apparent period of incubation, varying, say, from three to six weeks, during which time, the affected leg, below the knee, shows signs of inflammatory action, as may be evidenced by filling of the sheath of the back tendons, unusual heat, and, in some instances, by the formation of windgalls. The fact of these inflammatory effects disappearing on the completion of the bony growth, taken in conjunction with the history of the respective cases, convinces me that these splints, and probably many other splints, took some weeks to become sufficiently developed to be felt by the hand.

The lameness occasioned by a recently-formed splint is in no way proportional to the size of the deposit; for small splints often cause extreme lameness, while large ones, sometimes, occasion little or no inconvenience. In the former case, the lameness is probably due to inflammation deeply seated in the bone; but, in the latter, the increased action may be almost entirely confined to the covering membrane of the bone, which "grows as the tumour grows, and so accommodates itself to the increased super-

fices it has to spread over, without suffering any tension" (*Percivall*). An exaggerated form of inflammation in the substance of the bone, may occur from the effects of violent concussion; when, instead of a splint being formed, the effusion failing to get vent, is deposited in the bone, thus preventing that part, by blocking up its canals, from receiving nutrition; the result being that death of the affected portion of bone ensues.

A splint which does not interfere with a joint, tendon, ligament or nerve, causes lameness only during its period of formation. At the same time we must remember that the process of formation often occupies a considerable time, and that, after it has stopped, it is liable to begin again on receiving a fresh stimulus from direct or indirect injury.

TREATMENT.—If the only symptom of trouble is a slight inflammatory condition which can be felt by running the hand down the affected leg, no severe measures, such as blistering or firing, should be adopted for its reduction; for they sometimes cause an extension of the inflammatory process which would injuriously affect the animal's soundness. Besides, it is always advisable to let "well" alone. If there be no immediate hurry, even if the animal is slightly lame, it would be well to give him a rest, keep him on a moderate amount of laxative food (grass and carrots), and try the combined effects of massage and pressure on the bony enlargement. With this object we might rub the part with the hand or ball of the thumb several times a day, taking care not to render the skin sore; and to place on the splint a pad, over which we might apply a tight cotton wadding bandage (p. 45). In employing massage, we might use a little lanoline or sweet oil, which would greatly diminish the irritating effect of the friction on the skin. The pad for the application of pressure might be made of any suitable material: a piece of india-rubber covered with wash-leather, for instance. While carrying out this treatment, we might, from time to time, cautiously test the patient's capability of standing work, and use our judgment in drawing conclusions from his action. Failing to obtain success after, say, a month's trial of these mild, though often very beneficial, measures; we may apply two or three blisters of biniodide of mercury ointment (1 to 8 of lard or vaseline), at intervals of a fortnight or longer. If blistering prove insufficient to remove the lameness, we may try the operation of cutting down on the splint (periosteotomy), or remove it with a gouge or chisel, supposing that it is not close to the knee. In performing periosteotomy on a splint near the knee, care should of course be taken not to make an incision that might in any way lead to open joint. Periosteotomy and

cutting out splints are operations which should be undertaken only by persons who are well acquainted with the anatomy of the part.

If we are treating horses which have to "pay their way" at all hazards, or if the nature of the splint does not admit of mild measures, it will generally be best, in the first instance, to try periosteotomy or surgical removal of the splint.

Periosteotomy, which consists in cutting down on the splint and thus dividing the periosteum (covering membrane of the bone), gives, as a rule, great relief to the lameness caused by the painful pressure of the bony enlargement (the splint) on the highly sensitive periosteum, which is hard, inelastic, and plentifully supplied with nerves. Also, by cutting deeply into the enlargement, we relieve the inflammation by the bleeding from the congested blood vessels within the bone, as well as by division of the overstretched covering membrane.

Periosteotomy is best performed on the horse when he has been cast (p. 641) and properly secured. In order to diminish the sensibility of the part, we might make four or five subcutaneous injections (p. 633), near the intended incisions, of about 10 drops each of a 5 per cent. solution of hydrochlorate of cocaine; or we may put the animal under the influence of chloroform (p. 605). Having disinfected the instruments (p. 70) and shaved off the hair of the part to be operated on, we apply an Esmarch bandage from the hoof to above the knee, where we put on a tourniquet; and cut deeply into the enlargement, through the skin and periosteum. Before Lister demonstrated the immense advantage to be obtained from treating surgical wounds antiseptically, such an incision would have taken a long time to heal, and would have left a very ugly scar; but under the new mode of treatment, the separated edges quickly unite, and the resulting blemish is trifling.

Surgical removal of a splint can be performed by casting the horse, injecting cocaine (p. 608) or giving chloroform (p. 605), applying an Esmarch bandage and tourniquet, disinfecting the part, and making a longitudinal incision through the skin in such a manner as to expose the enlargement, which can be removed by a gouge or bone forceps, while the cut edges are held back on each side. The part is treated antiseptically (p. 70), sutured (p. 73), dressed with tannoform or some other suitable antiseptic (p. 67), covered with a few layers of antiseptic cotton-wool, and bandaged. Colonel Nunn, Deputy Director-General, A.V.D., remarks in "The Veterinary Record," June 22, 1901, that: "I always removed the growth with a McEwan's osteotome, either gouge or chisel shaped, and a mallet. I found that it was

well to employ a broad one, so that the whole of the growth should be removed and no trimming up be required, and with this object I took care to dissect the periosteum well away from the splint. I also was very careful not to close the skin wound until all bleeding had absolutely ceased after the tourniquet had been removed, and the few cases that went wrong I attribute to neglect of this precaution, the suggestion of which I am indebted to a friend in the Indian Medical Service. In my later cases, in which this was observed, the wound healed by first intention without any trouble.

"Needless to say rigid antisepsis is necessary, but Mr. Mayall's experience shows that conservation of the periosteum is not necessary. The majority of my cases went right without any recurrence of the splint, and only a slight cicatrix remaining. Those in which there was any blemish were, I think, due to suturing the skin before bleeding had altogether ceased."

This operation is very useful for removing a splint which interferes with the action of the opposite leg.

LEGAL ASPECT OF SPLINT.—I think I am safe in saying that the large majority of experienced veterinary surgeons will agree that a splint which is well away from the knee, and which does not interfere with the working of the tendons or ligaments, or with the action of the other leg, is not an unsoundness; provided that it does not cause lameness, and that the horse is at least six years old. The limit of age might in some cases be reduced. If the animal is young, and especially, if he has not done much work, the fact of his having a splint, would indicate that the leg is not of the proper kind to stand a good deal of "knocking about."

From "Margetson v. Wright" (see Moore and Scott's Cases in Common Pleas, etc., vol. i., p. 622), it appears that a horse with a splint can be passed sound, if the bony deposit, from its size and position, would not be liable to cause lameness; leaving out of consideration what its results might be, were it to increase in size, or invade other structures. Lord Chief Justice Tindal's judgment on this case was as follows:—"This was an action upon a warranty, in which the defendant warranted the horse to be sound in wind and limb 'at the time,' that is, at the time of the warranty made. The jury at the trial found a verdict for the plaintiff; the learned Judge requesting them to tell him distinctly whether in their judgment the horse was sound; or, if they believed him to be unsound, whether that unsoundness arose from the splint of which evidence had been given. In answer to which inquiry, the jury said, 'that, although the horse exhibited no symptoms of lameness at the time when the contract was made, he had then upon him the seeds of unsoundness arising from the splint.'

"The question upon this application for a new trial, is, whether this finding of the jury sanctions the verdict for the plaintiff or not; that is, whether the Court can see with sufficient clearness that the jury thought that the horse was unsound at the time of the contract, and, consequently, that the warranty was broken. It appears that the evidence before the jury was, in substance, that the splint might or might not be the efficient cause of lameness, according to the position which it occupied, and its size and extent; that this splint was in a very bad situation, as it pressed upon one of the sinews, and would naturally produce, when the horse was worked, inflammation of the sinew, and consequent lameness. The jury, therefore, drawing their attention to this particular splint to which the evidence related, appear to us to have intended that this individual splint, though it did not at the moment produce lameness, was, at the time of the contract, of that sort, and in that situation, as to contain, in their language, the seeds of unsoundness, that is, the efficient cause of the subsequent lameness. If the lameness complained of had proceeded from a new or different splint, or from the old splint taking a new direction in its growth, so as to affect a sinew, not having been on one before, such a lameness would not have been within the warranty; for it would not have constituted a present unsoundness at the time of the warranty made. But the jury find that the very splint in question is the efficient cause of the lameness.

"On the former motion, our attention was not called to any evidence, if any such was given, as to the different nature and consequences of splints, which the learned Judge reports to have been given upon the present occasion; but it now appears that some splints cause lameness, and others do not, and that the consequences of a splint cannot be apparent at the time, like those of the loss of an eye, or any other blemish or defect visible to a common observer. We, therefore, think that, by the terms of their written warranty, the parties meant that there was not at that time, a splint which would be the cause of future lameness, and that the jury have found that it was.

"We therefore think that the warranty was broken."

In "Smith v. O'Bryan" ("The Law Times," vol. ii., New Series, p. 346) the horse which was warranted sound, had a splint, that, at the time of sale, did not cause lameness. The fact of the animal subsequently becoming lame, on account of this splint, was held to be a breach of warranty.

Enlargement of the Splint Bones.

As a result of inflammation, we may meet with the two following forms of enlargement of the splint bones, without counting alterations in the size of these bones under the familiar forms of splint and spavin:—

1. *Enlargement of the head of the outer splint bone of a hind leg* (Figs. 84 and 85). Though this disease is well known to

Fig 84.—Jarde.

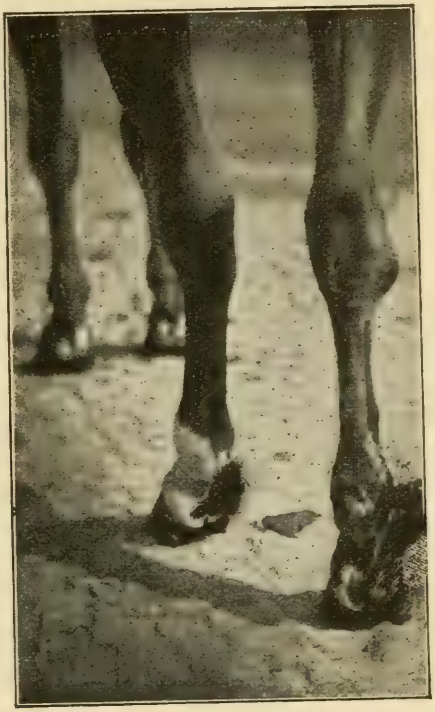


Fig. 85.—Jarde.

Continental veterinary surgeons (the French calling it *jarde*, the Italians *giarda*); no distinctive name has been given to it by English veterinarians, an omission which may be accounted for by the fact that the increase of size of the part and the influence of the disease on the animal's gait are generally not sufficient to attract attention. The term, sometimes used, of "spavin on the outside of the leg," is entirely a misnomer; for here, the bony affection does not extend above the head of the splint bone; while in spavin, one or more of the bones above the splint bone are always implicated. This limitation to the extent of the inflammation of the head of the outer splint bone of the hind leg, has been proved by careful researches made by Gillet, Goubaux, and Barrier. A *jarde*

(to use the French expression) is usually due to excessive strain of the ligamentous fibres (p. 230) which are inserted on that bone. The resulting inflammation causes enlargement of the bone near the seat of injury, and may extend downwards, thus increasing the size, to a greater or less extent, of the remainder of the splint bone; but not upwards, as already said. The inflammatory action may be confined to the splint bone, or may extend inwards to the head of the cannon bone, thus forming a splint, which (as explained by Goubaux and Barrier), by occupying a portion of the groove (formed by the cannon bone and two small splint bones) in which the suspensory ligament lies, will push out, to the rear, the suspensory ligament and the back tendons, and will thus give rise to curb. A *jarde* may also result from injury, as, for instance, a kick.

As a *jarde* does not extend upwards towards the joints of the hock, it is much less serious than a spavin. It is an interesting fact that the cases shown in Figs. 84 and 85, were those of hunters which exhibited no sign of lameness. We may treat as for spavin (p. 259).

2. Colonel Nunn mentions three cases which he has had of lameness in a fore leg from the enlarged bulb of the lower end of a splint bone (Fig. 86) pressing on the nerve. The part was found to be very painful on pressure being applied to it. A successful result was obtained by making a longitudinal incision on the enlarged bulb; dissecting back the tissues; and removing with a sharp bone forceps about 1½ inches of the end of the splint bone.

Sore Shins

in their fully-developed state, may be said to consist of bony formations which are generally confined to the front of the lower third of the cannon bone; although the inflammation may involve the whole of the front of the bone. The name is derived from the fact that the deposit is usually on the front of the bone. The disease being due to concussion, is generally confined to the fore legs; although, sometimes, all four cannon bones are implicated. Lameness from sore shins, like that from splints, is far more common among young horses than among older animals; but sore shins, unlike splints, are confined almost entirely to young racehorses, which animals get their work principally at the gallop, in which pace the heel is brought to the ground at a moment when the leg is stretched out to the front (Fig. 10); and, consequently, as the shock is transmitted vertically upwards from the heel, its effects will be felt at the lower part of the cannon bone, *i.e.*, at the seat of sore shins. In the trot, the heel meets the ground when

the cannon bone is in a much more upright position than it assumes at the gallop—in fact, the foot comes as nearly as possible, flat down; hence, trotters seldom suffer from sore shins, although they are subject to splints. Many two-year-olds, and even three-year-olds, which are trained, suffer, at one time or the other, from this ailment. Almost all these animals are put to work at far too early an age.

Sore shins, unless taken in time, is a serious disease, which in some cases proves fatal.

Fig. 186.—Enlarged end of splint bone.

SYMPTOMS.—Generally, the first symptom is that the horse begins to go a little " short " in his gallop, especially, if the ground be at all hard, although he may act as well as ever when it is soft. On being pulled up after a strong gallop, he may be found to walk in a very sore and tender manner; although hot fomentations and a rest for a day or two may apparently set him right. All that is required to develop the symptoms is to put him to fast work again, without loss of time. He will then, probably after the first gallop, be found to be hardly able to hobble along at a walk. Above and in front of the fetlock joint or joints, as the case may be, there will be a swelling which will be elastic and fluctuating at first, then firm and "doughy," will "pit" on pressure, and finally will become hard, on account of the exudation becoming

converted into bone. During the first or acute stage, the swelling will be painful to the touch; the horse will be lame and go very "short"; there will be more or less fever; and the animal will keep shifting his feet, if both legs are affected; or point the toe and bend the fetlock joint, if only one is implicated.

TREATMENT.—Blister the part, in the first instance, with biniodide of mercury ointment (1 to 4 of lard), which will almost invariably effect a speedy cure, and will generally prevent a recurrence of the ailment. Give a mild dose of physic, and keep the horse on laxative food. If the animal be a young racehorse, he will probably be fit to resume easy work in about ten days.

In neglected cases, or if the blister does not succeed in producing the desired effect, and the swelling is very extensive and the pain great, periosteotomy (p. 242) must be performed without loss of time, in order to admit of the escape of the exudation, which, by the pressure it exerts on the inelastic and highly sensitive periosteum, is the cause of the intense pain and fever. Besides, if the exudation be considerable, and it be allowed to remain between the surface of the bone and the periosteum, death of the bone may ensue; the process being, that this exudation becoming converted into bone will block up the small canals through which the bone receives nourishment by means of small blood-vessels proceeding from the periosteum. Before operating, we should carefully feel for the position of the extensor tendons (Fig. 7, p. 33) which run down the front of the cannon bone, so that these important structures be not injured.

If pus forms under the periosteum, periosteotomy should be performed without loss of time; for the pus will corrode the tissues, and may give rise to blood-poisoning.

After a severe case of sore shins, an appropriate rest should be allowed, and when the horse is put to work again, he should be exercised only on soft ground, so that there may be a minimum of the original cause of the disease, namely, concussion. At first the work should be confined to walking, trotting, and slow cantering, and we should bear in mind that time is the great healer of this disease. When the horse is galloped, the distance should be short, and the work, if need be, repeated, with about half an hour's walking exercise allowed between the "spins," so that the bones of the legs may be saved from long-continued jar. The advisability of warm fomentations after a gallop will naturally suggest itself to the trainer.

An attack of sore shins, in which the exudation has been excessive, will give a more or less rounded appearance to the front part of the cannon bone when viewed in profile.

Ringbone (Fig. 87).

is the vague term applied to bony deposits on the pastern bones, and is, for convenience sake, divided into three kinds, namely:—(1) *False ringbone*, which may be regarded as a bony deposit on the long pastern bone, situated on one or both sides of it: in some cases it extends to the front of the bone. This form, although not nearly such a serious affection

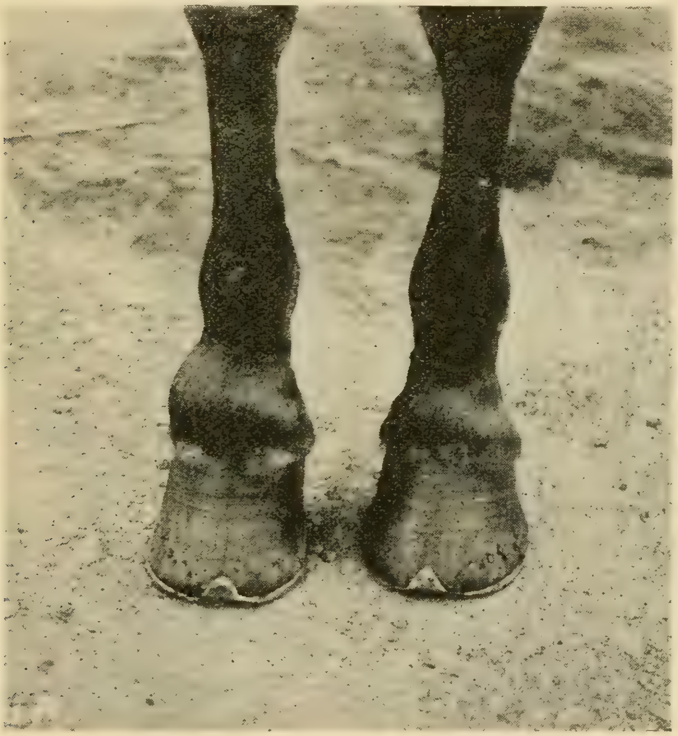


Fig. 87.—Ringbone on off fore.

as the next two kinds, occasionally causes lameness on account of its presence interfering with the action of the lower portion of the suspensory ligament. Also, it is sometimes accompanied by a diseased condition of the upper (articulating) surface of the long pastern bone, with the probable result of incurable lameness. In such cases, the lower surface of the cannon bone, which comes in contact with the diseased surface in question, is rarely affected. At the same time, we must remember that even when the bony deposit does not involve its neighbouring joint, it may from its size and consequent interference with tendon or ligament, as in Figs. 88 and 90, cause incurable lameness. (2) *High ringbone*

is the term usually applied when the deposit involves the joint which is between the long and short pastern bones. This is more common than the next variety, and may be readily seen in the form of a swelling on the front of the pastern (Fig. 87). A very severe case of this form of ringbone, with complete bony union between the two pastern bones is shown in Fig. 92. (3) *Low ringbone,* when the bony formation affects the joint between the pedal bone and the short pastern bone. This is far more serious than the first two, owing to the unyielding nature of the horny wall of the hoof which surrounds the implicated joint. Both high and low ringbone may be due to an inflammation which leaves the articular cartilages of the affected joints intact; or, according to Schrader, Möller, and other German writers, to rheumatoid arthritis (p. 269). Fig. 117 shows a case of ringbone from fracture.

These bony deposits are usually confined to the front and sides of the bones, and have a tendency to surround these parts. If they extend to the back of the joints, they will give rise to intractable lameness. As a rule, they are probably due to compression of the pastern bones, especially in the hind legs, or to sprain of the ligaments of the pastern joints. The symptoms may somewhat resemble those of "split pastern" (p. 302). Ringbones are more common on the hind, than on the fore feet, though the opposite is the case with sidebones. This difference is probably due to the fact that, in the hind feet, more work is thrown on the toe, than in the fore feet. I may here remind my readers that the lateral cartilages (p. 276) are situated on the sides and back of the foot; and that the front of the pasterns is the usual seat of ringbone. I have seen, on different occasions, cases of lameness from ringbone which had been induced by the horse "going on his toe," owing to a previously existing spavin. If concussion were a common cause of ringbone, that disease, contrary to what is actually the case, would appear more often in the fore legs than in the hind.

We should not reject a horse because his pasterns are "rough," that is, large and with prominent processes of bone for the attachment of tendon and ligament; as this is the best shape, always supposing that both pasterns are the same.

I have seen several cases of foals and yearlings having been treated for ringbone; although their pasterns and feet were free from disease. In these young animals, as explained by Möller, a false appearance of ringbone is often shown, on account of the comparatively large size of the heads of the pastern bones, and the incomplete development of the hoof.

In the early stages of ringbone, a horse becomes lame before any deposit is formed or any swelling takes place; for, here, the

cause of the pain is inflammation in the structure of the bone itself. When lame from this cause in a fore foot, the horse goes on the heel. The fact that the condition of the hoof and the state

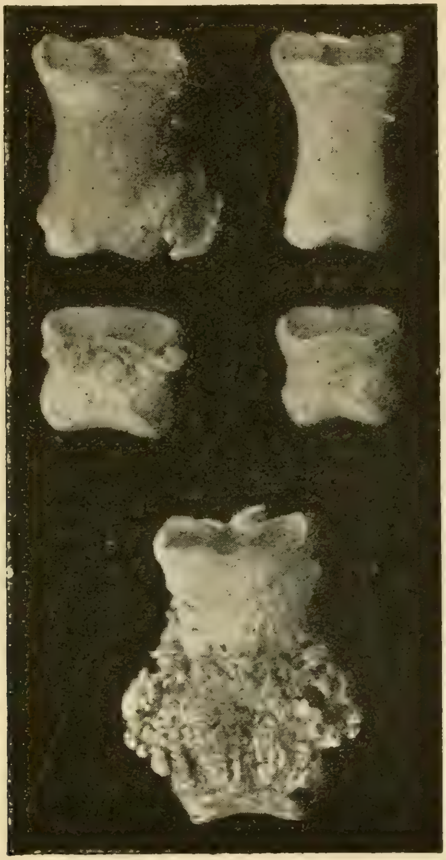


Fig. 88. Bony deposit on long pastern bone.

Fig. 89. Long pastern bone free from bony deposit.

Fig. 90. Bony deposit on short pastern bone.

Fig. 91. Short pastern bone free from bony deposit.

Fig 92. Extensive body deposit uniting long and short pastern bones.

of the pulse and internal temperature are healthy, will show that the animal is not suffering from laminitis. Writing about ringbones, Professor Williams remarks:—" When at the sides they

do not cause the same degree of lameness as when the front is involved."

I have often observed in the lameness of ringbone, that the horse lifts his foot off the ground in a peculiarly stiff manner, evidently, with the object of trying to bend the pastern joints as little as possible.

Ringbone must not be confounded with sidebone (p. 276), which is ossification of the lateral cartilages of the foot.

TREATMENT.—Although, to avoid a blemish, we may be tempted to try the effect of a biniodide of mercury blister in preference to the hot iron; it is no doubt the wisest policy in the long run to puncture fire deeply, as in spavin (p. 259), the moment ringbone manifests its presence; because, if we delay, enough bony material may be thrown out, in a short time, to permanently destroy the free action of the affected joint. The prompt use of the iron (taking care not to open a joint) is the best means to arrest the diseased action, and to cause the absorption of the bony material which has already been deposited. If the horse goes on his heel, use a thin rocker shoe (p. 197); if on his toe, employ a high-heeled shoe.

The operation of neurotomy is specially indicated in chronic cases of lameness from ringbone. It not unfrequently stimulates the absorption of the bony deposit.

Bone Spavin.

DEFINITION AND ANATOMY.—A bone spavin is a bony enlargement which, as a result of disease, forms on the inside and lower part of the hock (Figs. 93, 96 and 97). As a rule, the term spavin is used as referring to bone spavin, except when "bog spavin" is specially mentioned.

In the hock (Figs. 98, 129, and 130) we have the true hock joint formed by the astragalus and tibia, which serves for the bending and straightening of the leg; and to aid in the adjustment of weight during movement, there are six or seven (according as the middle cuneiform consists of one or two parts) small bones placed between the cannon bone and astragalus, so as to form joints possessed of a certain amount of gliding motion.

Viewed from the front (Fig. 129), we see that the astragalus rests on the large cuneiform bone; the large cuneiform, on the middle cuneiform; and the middle cuneiform, on the cannon bone. On the inner side (Fig. 98) the small cuneiform rests on the small inner splint bone and also on the cannon bone, and affords support to the large cuneiform. On the outer side of the hock, the cuboid bone rests on the cannon bone, stands alongside the large and middle cuneiform bones, and has a side bearing against the outer splint bone, the top of which is free from downward pressure.

NATURE OF THE DISEASE.—According to Gotti and Bayer, spavin is a chronic ostitis (inflammation of bone) which begins in the scaphoid, large

cuneiform, and metatarsal bones, and extends to the articular cartilages (p. 257) of the affected joint. Hence the best treatment consists in hastening the bony union of the diseased surfaces, which, as a rule, show little or no tendency to recover their normal condition. Rest, as complete as possible, is a very important factor in obtaining the desired bony union.

In bone spavin there is, as a result of inflammation, a deposition of bone on the inner and lower part of the hock, commencing, usually, between the middle cuneiform and the cannon bone, or between the middle and large cuneiform bones. The higher this bony formation extends, the more serious is the disease. When the spavin is low down, being then confined to the joint between the middle cuneiform and the cannon bone, it is of little consequence; as bony union of that joint does not affect the horse's action to any appreciable extent.

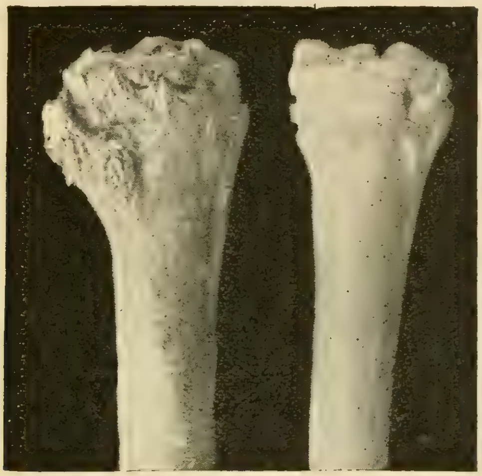


Fig. 93. Spavin. Fig. 94. No Spavin.

CAUSES.—We may reasonably assume that the usual cause of spavin is unduly severe compression of the bones of the hock, because we find that work which entails this form of injury is specially liable to bring on spavin; and that the more weight is put on the forehand, the less susceptible are horses to this complaint. Hence, racehorses do not suffer from spavin nearly so much as hunters, high school horses, and cart horses which have to drag heavy loads up hills. My experience is, that circus horses which, when in the ring, have to walk about a good deal on their hind legs and to perform such feats as cantering backwards and cantering with one fore leg continually kept off the ground, are more inclined to develop spavin than any other class of animal. We should here note that the nearer to a perpendicular direction the weight of a horse and rider falls on the hocks while these joints are being straightened out during movement, the more will the bones of the hocks be compressed. Sprain of the short (inter-

osseous) ligaments which bind the bones of the hock together, is a possible cause of spavin.

HEREDITY AND PREDISPOSITION.—As spavin is due to causes which come into existence after birth, it cannot be regarded as a hereditary disease. Hereditary predisposition, however, plays a large part in its production. In the *first* place, the process of evolution in the horse, which is a single-toed animal that has descended from five-toed ancestors, predisposes him to suffer from bony union of the bones of the hock, in the same way as it predisposes him to splint (p. 232). *Second*, the weaker the bones of the hock are in comparison to the weight of the body, the more inclined will the animal naturally be to contract spavin. *Third*, bad conformation of the hocks has undoubtedly a predisposing influence. When a horse is "tied in below the hock" (namely, when the width of the leg just below the hock, viewed sideways, is small in comparison to the width of the fetlock), the bones of the hock will present a comparatively small surface over which compression has to be distributed. Also, "cow-hocked" horses (the points of whose hocks are brought comparatively close together) are said to be predisposed to spavin; the probable reason being that the more the points of the hocks are turned in, the more the toes are turned out, and, consequently, the more weight is thrown on the inside of the leg. *Fourth*, impetuosity is evidently a predisposing cause. *Fifth*, keeping the slope of the hind feet at too acute an angle appears to predispose the animal to spavin, apparently on account of the mechanical disadvantage at which it places the muscles that straighten the hock. Dr. Eberlein ("Journal of Comp. Path.", Sept. 1898) tells us that "Glemm has experimentally shown that excessive cutting away of the heels in shoeing is specially injurious in this way. Out of fifteen horses that were shod with low heels, nine became affected with spavin in from one to two months. I have myself had the opportunity to verify Glemm's views, and have obtained similar results. Peters observed that spavin is specially frequent on soft boggy land and uneven pavement."

SPAVIN FROM A BREEDING POINT OF VIEW.—As individually acquired characters are not hereditary, it would be as reasonable to reject an animal for breeding purposes, because he had a spavin, as it would be, because he had lost an eye by a gunshot wound. Here the point to consider, is that predisposition in the form of defective conformation is hereditary. Hence, in this case, rejection should depend on the nature of the conformation, and not on the presence of the spavin. When such a decision

is entrusted to a man who knows little or nothing of equine conformation, although his knowledge of anatomy and pathology may be perfect, it will probably be safer for him to reject the animal than to pass it.

CAUSE OF BONY ENLARGEMENTS BEING FOUND MORE FREQUENTLY ON THE INSIDE OF THE HOCK, THAN ON THE OUTSIDE.—Although this question has not been definitely decided, it seems probable that this predisposition is due to more

Fig. 95.—Clean hock.

Fig. 96.—Slight spavin.

Fig. 97.—Well-marked spavin.

weight being put on the inside of the foot than on the outside. Owing to the fact that the grooves on the bones (tibia and astragalus) which form the true hock joint are directed obliquely outwards as well as forwards, the toe of a hind foot is rotated slightly inwards, when the limb is straightened out to the rear, while the foot is on the ground. The occasional occurrence of bony enlargements on the outside of the hock (p. 245), shows that excess of strain is not always confined to the inside of that joint.

COMPARATIVE GRAVITY OF SPAVINS.—Percivall justly lays stress on the fact that horses should not be condemned indiscriminately on account of having a so-called low spavin, which, he contends, is in many cases a veritable splint, and has no con-

nection with the small bones of the hock, which are above the cannon bone and splint bones.

I believe that a splint, having the appearance of a low spavin, rarely occurs on the head of the cannon bone without involving the cuneiform medium also; although union of these bones frequently takes place without the action of the animal being affected in any perceptible manner; as there is very little motion in that joint. The cuneiform medium, as the seat of spavin, has a naturally well-marked bony ridge on its surface, which gives it the appearance of having a small splint (Fig. 129).

The more to the front of the hock the bony deposit is situated, the greater danger is there of its giving rise to lameness; because in that case it is more apt to interfere with the action of the joint, than if it was at the side.

The lameness of spavin in horses six years old and under is usually curable; but not that of old horses (see remarks on occult spavin).

Coarse hocks need not be viewed with suspicion if both be exactly similar and if the action is good. Faulty action from spavin is generally indicated by undue wear at the toe (Fig. 1, p. 6). The term, "coarse" hock, is applied to those hocks in which the head of the cannon bone and the prominences on the bones above it are largely developed. In them, the cuneiform bones are large, and consequently this shape is the one which is best adapted for diminishing the ill effects of concussion and compression. Although the hock shown in Fig. 96 and its fellow were too coarse to be passed by most veterinary surgeons; their owner, a well-bred Irish mare, had perfect action in them, and was a very clever hunter and remarkably "big" jumper. This furnished a good example of the not uncommon case of the existence of spavin being no detriment to a horse's action. Experience teaches us that work develops bone as well as muscle; consequently hunters, as a rule, have coarser hocks than hacks and light harness horses.

If an "aged" horse has coarse hocks and goes sound, especially, if he has good action, there is little probability of his becoming lame in them. Young horses often have enlarged hocks which fine down as they grow older.

OCCULT SPAVIN is the term used to signify that condition of the hock in which no external evidence of disease can be observed; although the lameness due to pain in the part may be of a most inveterate form. We have here ulceration of the surfaces of the bones which form the gliding joints without bone being deposited between or about them. In health, the dif-

ferent bones of a joint never touch each other; as they are separated by articular cartilage. In ordinary bone spavin, this cartilage becomes ulcerated as the result of inflammation extending from the bones, and is finally absorbed; the exudation thrown out from the blood-vessels of the bones being converted into bony material, which causes bony union and consequent destruction of the joint. Here, we have a reparative process with cessation of inflammation. In occult spavin, on the contrary, the process stops short at ulceration, and no reparative action takes place; hence, the serious and intractable nature of this form of the disease.

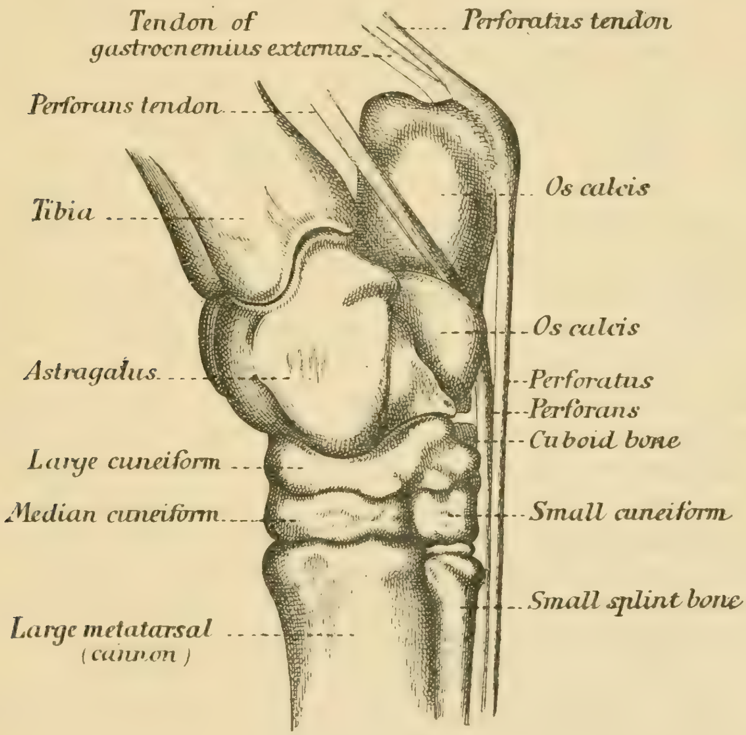


Fig. 98.—Inner side of off hock.

Occult spavin is naturally much more common in old, than in young horses; for, in the latter, repair is much more active than in the former. As the inflammation, and not the deposit, constitutes the disease, we must regard bone and occult spavin as one and the same complaint.

SYMPTOMS.—The lameness of spavin is characterised by want of freedom in bending the hock, which causes the horse to "drag his toe" and to wear the hoof at that part (Fig. 1); and by the lameness getting better as he "warms up" at exercise. In severe

cases, and especially in occult spavin, the lameness "consists in a sort of spasmodic catching up of the spavined limb the moment the heel of the foot comes down upon the ground, something after the manner of stringhalt" *(Percivall)*. At times, the stiffness can be observed only when the animal is pushed over from one side to the other in his stall. A spavin may often be detected when riding a horse down a steep hill, from the fact of his "dragging the toe." "The time of all others when a spavined horse will be apt to manifest his lameness will be the day following after a hard day's work; and when he makes his first egress from the stable in the morning is the critical period for examination" *(Percivall)*. Therefore, we should be prepared to form our judgment quickly in these cases; for the longer the animal is trotted up and down the less lame will he generally become. At the end of each trot past, he should be turned a different way; for instance, first to the left about, then to the right about, so that we may see on which hind leg he turns best. If there still be a doubt, the foot of the suspected leg may be taken in the hand, drawn upwards and held (Fig. 2), so that the hock may be kept bent for a couple of minutes, and then the foot may be let down. If spavin is present, lameness will become very apparent, if, after that, the horse be trotted.

We may have the visible sign of spavin—swelling at, and hardness of the part—without lameness. If there be heat and tenderness on pressure, lameness will almost certainly be present. A careful comparison by the eye should be made of both hocks. If they are found to be exactly similar and no trace of lameness is present, the horse may be passed as all right. The observer while standing close to the side of its respective fore leg, should view each hock, and should see if there be the slightest difference between the two hocks, or abnormal prominence on the site of spavin of either. "Now it is precisely the interval between the prominence of the hock ceasing and the cannon beginning—the part of the superficial line which constitutes the dip from one into the other—that is the site of spavin; a small round tumour interrupts the natural declivity from the hock to the cannon, and in a moment catches the eye of the experienced observer. In cases where the tumour, from its smallness or flatness, or diffuse character, is indistinct to the eye, the examiner will not make his mind up concerning it until he has narrowly compared the suspected with the sound or normal hock" *(Percivall)*. See Figs. 93, 96 and 97. He should satisfy himself by feeling both hocks, the near with the right, the off with the left hand. A more correct impression is conveyed by a light and moderately rapid touch, when running the hand down, than by dwelling long and pressing hard.

The existence of a spavin in the form of a small point of bone,

towards the front of the joint, often causes severe lameness, and is difficult, if not impossible, to be detected without feeling the hock with the hand.

When a horse is chronically lame from spavin, the muscles of the affected limb tend to waste away considerably from inaction. In severe lameness of the hind extremities, the animal evinces great disinclination to lie down, on account of his knowledge of the difficulty he will have in getting up; and his condition suffers proportionately.

Horses do not often become permanently lame from spavin, which is consequently a much less grave affection, as a rule, than a sprain of a back tendon or of a suspensory ligament, laminitis, navicular disease, and many other ailments. This disease, when causing lameness, is far more intractable in old horses than in young ones, because processes of repair are much more active in the latter, than in the former.

TREATMENT.—We should bear in mind that it is impossible to cure a spavin, that is to say, we cannot restore the affected part to its normal condition. All we can do, is to hasten the completion of the inflammation, and the consequent removal of the lameness.

In the very early stages of this lameness, with or without heat and swelling at the site of spavin, we may endeavour to subdue the inflammation before any structural change takes place; the best means being the administration of a dose of physic (aloes); the application of warm fomentations; and rest. If the lameness does not yield to these simple means, the best thing to do is to fire (as recommended by Eberlein) into the centre of the enlargement with a pointed needle-shaped firing-iron, which can be got from any veterinary instrument maker. It should be about the thickness of a knitting-needle at the base, and about an inch in length. It is best made of iron, as it requires to be rigid, in order to perform its task properly. Iron-holders, with a knob at the end to carry the needle, are the most convenient instruments to use. The hair on the spavin should be shaved off, the part well washed with carbolic soap and warm water, disinfected with an antiseptic solution (p. 67), and dried, preferably with a piece of antiseptic cotton-wool. As a rule, there will be no need to cast the horse, which can be tied up, one of his fore legs suspended from a surcingle, and a twitch put on him. When placing the iron in the fire, the needle should be kept uppermost, so that it may not be injured, and it should be brought to a white heat. Two or three punctures well into the bone will be sufficient, and care should be taken that neither the true hock joint nor any

of the sheathes of the tendons are punctured. A firing needle should be heated each time before it is used, so that its application may not cause either infection or putrefaction. After the punctures are made, the part should be covered with an antiseptic (p. 67). If necessary, the horse can be cast. He should be put in slings, should remain in his box or stall for at least a month, and should be kept on green grass, or on hay and carrots. As the chief seat of the disease is in the interior of the bone or bones, deep puncture firing gives far better results than line firing or firing with a pear-shaped iron (Fig. 99). Blistering and periosteotomy are rarely of any use in spavin lameness.

It is advisable before firing to rest the horse for a few days, and cool him down with green food, and Epsom salts (p. 609). As the principle of puncture firing is to excite violent inflammation in the part, so as to promote the bony union of the diseased surfaces; rest as complete as possible should be given after the operation, until the completion of the desired union, which would be retarded or altogether checked by movement. Hence the advisability of using slings.

A high-heeled shoe (Fig. 4, p. 27) is indicated in spavin lameness.

LEGAL ASPECT OF SPAVIN.—The fact that it is impossible to draw a sharp line of demarcation between a "coarse hock" and one with spavin, renders the subject of spavin a fertile cause of dispute. Following the opinion held by Dick, Percivall, Barlow, and Williams, among others, I think I may safely say that, if both hocks are alike, the action perfect, and the power of bending the joints unimpaired, a horse with coarse hocks should be passed sound. In a case of slight spavin without impairment of action, such as that mentioned on p. 256, I would recommend an intending purchaser to buy, if the animal was otherwise suitable; although I could not give a certificate of soundness; for a bone spavin (Watson v. Denton, see "Carrington and Payne's Reports," vol. vii., p. 85) is an unsoundness, even when it does not produce lameness. The fact of the existence of a spavin may naturally be, and often is, a subject of contention.

Osteoporosis (*Big-Head*)

appears to be a constitutional disease which manifests itself by a swollen and porous condition of the bones, and by more or less general paralysis. It is also known as osteomalacia, fragilitas ossium, and mollities ossium. As little or nothing is known about the nature of this disease, the names applied to it have no scientific weight. A swollen and porous condition of certain bones may be

also observed in cases of actinomycosis (p. 125). Although the term, osteoporosis, is often applied to such a local condition of bone, I restrict, for convenience sake, the use of this expression, to the general disease which we are at present considering. The characteristic swelling of the bones of the nose, owing to their prominence and porous nature, attracts most attention; hence the popular designation "big-head," which is applied to this malady. In fatal cases, the animal seems to die from exhaustion. It attacks all classes, and both sexes of horses. As a rule, it is confined to young animals; although I have known instances of nine or ten year olds having died of it.

CHANCES OF RECOVERY.—As far as my experience goes, animals which are affected with osteoporosis, and which are kept under the conditions that give rise to it, invariably die from it. The only hopeful cases are those which are properly treated in an early stage of the disease.

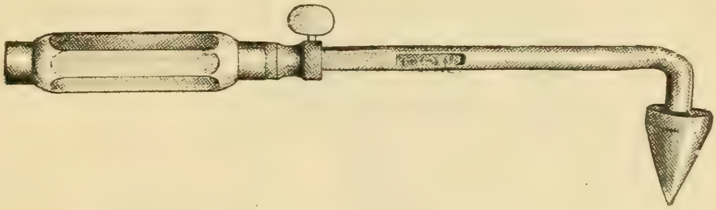


Fig. 99.—Pear-shaped firing iron.

DURATION.—Fatal cases usually run a course of several months. Occasionally, the period is two or three years.

GEOGRAPHICAL DISTRIBUTION.—This disease appears to be confined to no particular country. Although I have noticed its occurrence, chiefly, in Eastern Bengal, Ceylon, Singapore, and South China—all of which places have a hot moist climate—I have seen a large number of cases (all confined to one stud farm) in the native state of Bahawulpore in the Punjab and a few in South Africa, the climate of both of which countries is dry and hot. To judge by the fact that Friedberger and Fröhner describe horses as suffering from rickets but not from osteomalacia (osteoporosis); this disease would appear to be very rare on the Continent. It is found in certain parts of North America, the Sandwich Islands (Harold B. Elliot) and Australia (W. T. Kendall).

SYMPTOMS.—I have remarked that the characteristic swelling of the face appears midway between the upper corner of the nostril and the eye (Fig. 100). The enlargement is diffuse; though fairly well defined. With very few exceptions in the cases I

have seen, both sides of the face have been affected. In the exceptional instances, which I saw only in their early stage, the enlargement had appeared quite suddenly. I do not think there is any definite rule as to the speed with which this growth increases. I have known instances in which it appeared very slightly; remained quiescent for some months; and then rapidly increased until the animal shortly afterwards died from the disease. In cases of recovery, the enlargement of the face persists, unless the advance of the malady be checked in a very early stage, when the swelling may disappear. When the enlargement is well marked, it gives the face a flattened and swollen appearance. The bones of the lower jaw are, also, generally swollen. In the cases I have seen, the bones of the face, below the eyes, were the only ones which were visibly affected.

The mucous membrane of the mouth appears swollen and pale, and is covered with a copious supply of dirty-looking mucus. With the advance of the disease in the bones of the lower jaw, the teeth become loose. I have seen some good instances in young horses, of dentition being retarded to a marked extent by this complaint; that is to say, the mouth showed the animals to be a year or more younger than they were.

Soon after, and occasionally before, the swelling of the bones of the face has become manifest, the animal may be observed to go stiffly "all round"; and the consequent lameness is generally associated with well-marked loss of condition. In the usual course, this stiffness will soon unmistakably assume the character of general paralysis, which, according to some authorities, is due to the bones becoming so wanting in tenacity that they lose their power of affording sufficiently firm attachment for the various tendons and ligaments. Bland Sutton's theory of pressure on the spinal cord being the cause of the paralysis of rickets (p. 266), may also be applicable to that of osteoporosis. When investigating this point *post mortem*, we should make transverse sections through the vertebræ, so as to see if their calibre has become narrowed by the inward swelling of the bone.

I have found in two or three cases which had recovered, that the resulting alteration in the nasal passages made the horse a confirmed "roarer."

APPEARANCE AFTER DEATH.—The enlarged bones are abnormally vascular and extremely brittle.

CAUSES.—I believe feeding on innutritious grass to be one of the chief causes of this disease, and have observed in all the cases I have seen, which have amounted to many score, that the

sufferers had been previously kept on this kind of fodder. I saw this fact well exemplified in Hongkong, where the Happy Valley forms the only pasture-land. As this is a more or less flat piece of ground, about 1¼ mile round, nearly on the level of the sea, and as it receives almost all the water which drains off the sides of the neighbouring hills; the grass on it, in that tropical climate, is, naturally, very coarse and rank. One gentle-

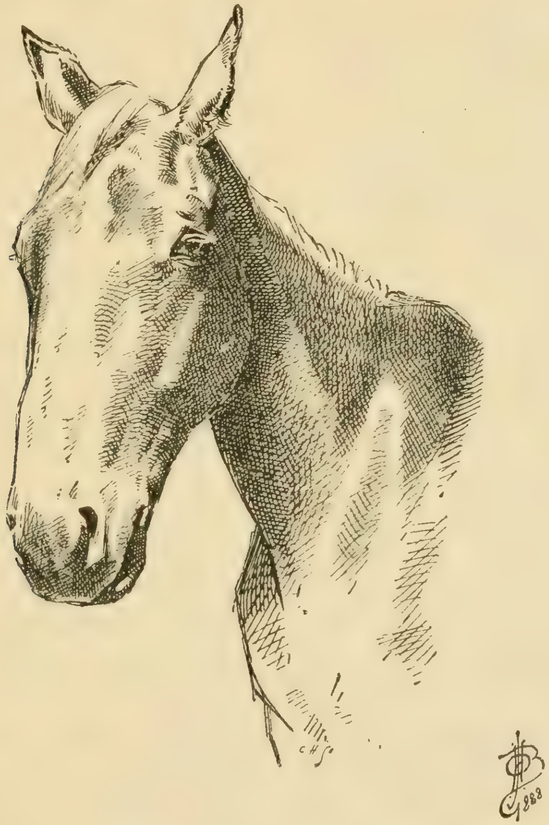


Fig. 100.—Horse's head suffering from osteoporosis.

man whom I knew there, had five ponies that died from this disease, all of which had shown symptoms of it only after having been turned out to graze in the Happy Valley. He had no case of it among those ponies of his which had not been turned out. While in the colony, I met other horse owners whose experience was similar to that of this gentleman. The effect of a damp climate on the grass of districts in Hawaii (see Mr. Elliot's remarks on pp. 264 and 265) is to render such herbage innutritious.

I once had in India, a lately-imported five-year old Australian mare, which I put on green grass, as she was in bad condition.

After she had been on this diet for about three weeks, she became listless and slightly paralysed, and quickly developed on one side of the face the characteristic swelling of osteoporosis. I at once had her fed on hay which had been made from young oats, and the enlargement subsided, and the mare got all right in a few days

I saw on one occasion at the Bahawulpore Stud Farm a great many cases—about 20 per cent. of the entire number—of osteoporosis. The young colts and fillies had a fair supply of corn; but the grass was so coarse and innutritious as to be altogether unsuitable for horse provender. Besides, it was grown on ground which was small in extent, and which had remained unchanged and untilled for many years.

This disease does not appear to be due to an insufficient supply of corn; for we find, all over the world, horses perfectly healthy on grass alone, in countries where osteoporosis is unknown. Besides, I have seen it appear in Ceylon, among young horses which had been kept for several months previously, on a very liberal allowance of oats. Their grass, however, was coarse and rank. It is instructive to note that the percentage of mineral matter in good hay is at least double that in oats, and that the percentage in both cases is greatly affected by the nature of the soil upon which the grass and corn are respectively grown. In either case, the fodder will be abnormally poor in bone-forming material, if it has been produced on land poor in lime.

Deficiency in the amount of grass cannot induce osteoporosis; for thousands of horses in Egypt, Syria, Arabia, and other places where osteoporosis is very rare, remain free from this disease; although for nine or ten months of the year, they get no grass; their only food being barley and barley straw. Also in South Africa, where the disease is uncommon, many of the horses never get either grass or hay; only straw and Indian corn, or straw and oats. Straw (see "Stable Management and Exercise") contains nearly as much mineral matter as hay. As horses in the open, contract the disease as readily as those which are stabled; confinement cannot be regarded as a cause.

A second cause, advanced by Mr. Geo. H Berns ("American Veterinary Review," Dec., 1890), is residence in a damp situation, such as a stable in a cellar, or on low ground. I believe that pit ponies are specially liable to this disease.

Mr. Harold B. Elliot, M.R.C.V.S. ("Journal of Comparative Pathology," Dec., 1899), tells us that he is convinced from practical experience that the disease is not due to diet, but wholly to climatic influences. It is very common in the Island of Hawaii, which is the chief sphere of his practice, and which furnishes at

least 100 victims every year. Some parts of this island of the Sandwich group are very damp, and have an annual rainfall of about 150 inches. Other districts are dry, and are rarely favoured with rain. In the former, the disease is remarkably prevalent, but it never occurs in the latter. Removal of affected animals to a dry district is followed by immediate improvement and ultimate recovery, which is a termination that does not otherwise take place. He states that horses will contract it under any conditions of diet, and that it seems to be regulated only by climate. "Altitude and temperature do not appear to affect the course of the disease. In my district, cases are seen both at sea level and on elevated lands where the thermometer occasionally registers freezing point. Owing to the lack of nutritious forage there are no breeding establishments in the rainy districts, and of the few foals which are born, nearly all succumb to the disease before attaining maturity. The geological formation of the island is similar throughout its whole extent, and is purely volcanic. . . The recoveries resulting from change of locality contrast strongly with the inadequacy of drugs. Two thorough-bred animals, each four years old, were in the last stages of this disease; they were removed to a dry district, well fed, and allowed the run of a small paddock. Restoration to normal health was effected in three months."

NATURE OF THE DISEASE.—Osteoporosis appears to be a specific inflammation of bone by which a portion of the earthy matter become dissolved. Its course closely resembles that of human "rarefying ostitis," which is described as follows by Erichsen: "A portion of compact bone undergoing this change is in the earliest stages slightly redder than natural; the openings of the Haversian canals after a time become somewhat increased in size, and consequently a larger number are visible to the naked eye. As the process advances, the Haversian canals increase at the expense of the bone surrounding them, and when they reach a sufficient size, they can be seen to contain a small quantity of pink granulation tissue surrounding the vessel. If a portion of the bone at this stage be macerated, it presents a porous, spongy appearance, almost resembling cancellous tissue." The Haversian canals are the extremely minute canals (they vary from a 200th to 2,500th part of an inch in diameter) which run through the substance of bone; and cancellous tissue is the spongy portion of bone.

Considering that osteoporosis is, as far as I have been able to find out, confined to certain districts, and that in other places errors of diet, no matter how much intensified, appear to have no effect in setting up this disease; I cannot resist making the conjecture that it is due to some specific poison contained in the fodder consumed. Up to the present, no exact information has been obtained respecting the manner in which the diseased condition of bone is brought about. The facts which I have given in the preceding paragraphs of this section, show that osteoporosis can occur when the food has a sufficiency of nutrient matter, including salts of lime.

DISTINGUISHING SIGNS.—See "Distinguishing signs of rickets," page 268.

PRINCIPLES OF TREATMENT.—I have seen the best results obtained from the adoption of the principle that the disease is due to some noxious

matter in the forage; and would accordingly advise complete change of grass or hay. I have in no case been able to trace the disease to the consumption of any particular kind of corn. Knowing the good effects of the administration of salts of lime, iron, phosphorus (page 269), and fat (in the form of cod liver oil, linseed oil or butter, for instance) in apparently allied diseases of bone, we might also employ these agents here.

TREATMENT.—Mr. Berns, whose experience of this disease is similar to that of Mr. Elliot, states that he has seen well-developed cases cured solely by change to a dry location. We should change the grass or hay. Give if possible (as is the custom in Australia and South Africa) unthrashed young oats (oaten hay). If sound hay or grass different to that on which the affected animal was fed, be unobtainable, I would substitute for it, bran and straw, say, seven pounds of the former (to be given dry) and a full supply of the latter. I recommend bran, because it is very digestible, and contains a large amount of bone forming material.

Mr. Woods, F.R.C.V.S. ("The Veterinary Journal" for August, 1879), writes:—"Several slight cases, which were at once brought out of the (coal) pits, recovered. They were put in loose boxes at the farm, and treated with a mild laxative (linseed oil), followed by mineral tonics and chlorate of potass dissolved in the drinking water. Mashes and grass were given as food." A pint of linseed oil would be sufficient as a laxative; and a drachm of sulphate of iron might be given daily in the food, and 1 oz. of chlorate of potass in the water. Salt should be supplied, either in the form of a large lump of rock salt, for the animal to lick when he likes; or mixed in the food, to an amount of 3 or 4 oz. daily. We might treat as for rickets (see following section).

Rickets.

Rickets is a disease of youth, namely, of a period of life during which development of bone takes place. It is rare in the horse, and is almost entirely confined to foals and yearlings. It also affects children, monkeys, ruminants, rodents, marsupials, large and small cats, bears, swine, dogs, seals, birds, and probably all other animals possessed of bones. T. D. A. Cockerell considers that even shell fish suffer from it. "So frequent is it among quadrumana that half the monkeys and lemurs brought to this country die rickety" (*Bland Sutton*).

NATURE AND CAUSES.—Rickets is a general disease in which the principal manifestations are increased development of new bone which is abnormally soft and weak, and the formation of bony tumours (exostoses), especially about the joints. The existing bone remains practically unchanged. The surface of the

body is unusually sensitive to pressure. This disease appears to be caused by deficiency, in the food, of salts of lime, or of want of power of assimilating such salts on account of the absence, in the food, of other constituents which are necessary to healthy digestion. Thus, Cheadle "cites a case of most extreme rickets occurring in a child fed on skim milk, and also the beneficial effect of cod liver oil. The cure of rickets in the lion cubs at the Zoological Gardens, which were fed only on horse flesh, by giving them cod liver oil and pounded bones with milk is a remarkable instance of the part played by an improper diet in the production of the disease. . . A deficiency of lime in the water of the district has also been stated to be a cause of this disease, but this is evidently not the case, for rickets is far more common in London, which is supplied with water containing a considerable amount of lime, than in Glasgow, where the water contains merely a trace" (*Erichsen*). In human practice, the urine of rickety patients sometimes has an excess of phosphate of lime, which is derived from the imperfectly digested food, and not from the rickety bones. Rickets is essentially a disease of youth; as it is connected with the deposition of new bone.

The chief causes of rickets in the horse are a supply of milk which is defective in quantity or quality; food which does not furnish a sufficiency of salts of lime; too high feeding; and want of exercise. All these causes may be intensified by insanitary conditions. Hereditary influence in this disease seems to be confined to the mare; for no part appears to be taken by the sire. Although it is probable that some foals, like some children, are born rickety; the exciting causes after birth are far more potent than those before birth. On the Continent, foals not very infrequently get rickets from being fed almost exclusively on bran, which, like oats, contains much less mineral matter than hay. Roloff, Voit, and others have proved by experiment that rickets can be produced by feeding young animals on food which is deficient in salts of lime.

Carnivorous animals are liable to rickets if they are fed on meat without bones; and pigs, if their food consists almost entirely of potatoes, which are poor in salts of lime. Rickets appears to be less common on soils which are rich in lime, such as those of chalk and limestone, than on soils poor in lime, like those of gravel, sandstone, and granite.

The swelling of the joints in rickets is caused by inflammation set up, on account of the ligaments of the joints breaking away from the soft bone to which they are attached.

SYMPTOMS.—The first symptom to be generally noticed is

decrease in power of movement from one place to another, and fatigue from comparatively slight exertion. There is gradual swelling of the joints, chiefly of the hock, knee, and fetlock. The animal may knuckle over in front and behind, or his hind fetlocks may descend down on the ground. In bad cases, the difficulty in moving about gradually increases, until the animal is unable to walk or even stand, and dies from want of food and exhaustion; and there is a greater or less degree of paralysis of the limbs, which has been shown by Bland Sutton ("Introduction to General Pathology") to be due to the gradual filling up, with spongy bone, of the spinal canal, so that continued and increasing pressure is exerted on the spinal cord, which, on that account, wastes away and becomes unable to properly stimulate the muscles of the limbs to exertion. The bones of the spinal column (vertebræ), except those of the tail, have a canal in them in which lies the spinal cord, and these united canals form a passage (the spinal canal) which is continuous with the cavity containing the brain. Thus, the spinal cord is a continuation of the brain, and with it forms the great nervous centre which, by means of the conducting nerves, receives impressions from the various senses, and transmits stimuli to the muscles. Continued pressure on nervous matter causes it to waste away and to lose its power of stimulating muscles to movement; paralysis being the result.

In rickets the bones become so abnormally brittle, that they are apt to break with little or no unusual provocation. The curvature of the bones of the limbs which is characteristic of rickets in children, pigs, and dogs, for instance, is seldom well marked in horses. In this disease, dentition is delayed in the same manner as it is in osteoporosis (p. 262). The patient may remain in good condition if fed in the ordinary way, even when it cannot stand. Rickets runs a chronic course of several months.

DISTINGUISHING SIGNS.—Rickets may be mistaken for rheumatoid arthritis, umbilical pyæmia (p. 532), or osteoporosis. The swelling of the joints in rickets is of a far less inflammatory nature and runs a much more chronic course than in umbilical pyæmia, or in the rheumatoid arthritis of foals. The presence of pus in the affected joints and constitutional disturbance are typical of umbilical pyæmia. The peculiar swelling of the bones of the face, the general progressive paralysis, and the absence of marked joint troubles of the limbs separate osteoporosis from rickets.

CHANCES OF RECOVERY from an attack of rickets are not very hopeful; for our equine patients have, as a rule, to be cured sound; and not with the mere capacity of living. Rickety children

readily recover under proper treatment, though the deformity generally persists.

TREATMENT.—If the foal has not been already weaned, we should, if possible, put it to a healthy foster-mother which has plenty of milk. If it has been taken away from its dam too early, it should be sent back to her, put to an efficient foster-mother, or liberally fed on cow's milk, to the daily ration of which 15 grains of pepsin may be added, in order to reduce the amount of hard curd that is deposited from the milk of cows. To make cows' milk of approximately the same composition as mares' milk, we should add to each pint of it, half a pint of water and three-quarters of an ounce of sugar. Phosphorus has been proved by Kassowitz to be the most valuable drug in this disease. In young foals it may be given daily in doses of one-tenth of a grain dissolved in an ounce of cod liver oil or linseed oil. As iron has a good effect in this disease, we may give 10 grains of sulphate of iron twice a day to the young foal, or better still, if cost be no great object, an ounce of steel wine (vinum ferri). A pint of lime water mixed with milk may be given daily, especially if there be signs of diarrhœa or acidity. The food should be carefully regulated according to the principles already discussed.

Rheumatoid Joint Disease (*Rheumatoid Arthritis*).

GENERAL REMARKS.—In mankind, rheumatoid arthritis is not an uncommon disease, and consists of a chronic and incurable inflammation of one or more joints, the hip being a favourite seat. As a great rule, it is a malady of old, or at least, middle-age; and, when it occurs, often follows an injury to the part, or chill. "The essential cause of the disease is indeed unknown. It appears to have no connection with tubercle, gout, or true rheumatism except in so far as these act as depressing agents" (*Erichsen*). The bones that form a joint, as I have explained on p. 257, do not come in contact during health, but are kept apart by the articular cartilages which respectively cover the ends of the bones, and which thus form two smooth surfaces that being lubricated by synovia (joint oil) work on each other without injury. "The starting point of the disease appears in most cases to be the articular cartilage. The first change observed is a loss of polish and smoothness, gradually increasing till the surface becomes velvety in appearance. Microscopic examination shows that this change is due to the gradual conversion of the matrix into fibrous tissue, the fibrillæ of which are arranged at right angles

to the surface" (*Erichsen*). Owing to loss of smoothness, friction is set up, with the result that the opposing and altered cartilages become worn away, and the ends of the bones are brought into contact. As exposed bone is unable to bear friction with impunity; the surfaces which, during movement of the joint, now rub against each other, become inflamed, and a deposit of very compact bone is formed in their substance. When the opposing surfaces of bone have assumed this ivory-like or porcelaneous structure, the joint, when moved, will naturally be liable to emit a creaking sound, which is a frequent symptom of the disease in an advanced stage. The effect of the inflammation, if long continued, is to more or less enlarge and deform the ends of the bones which form the joint, and to cause a deposit of bony material about the diseased part. From the foregoing remarks I think we may assume, at least for convenience sake, that rheumatoid arthritis is an inflammation of articular cartilage, followed by destruction of the opposing portions of cartilage, and by the deposit of peculiarly dense bone on the exposed bony surfaces.

In the horse, we can recognise two, if not three, forms of joint inflammation closely resembling rheumatoid arthritis of man. They may be described as follows:—

(1.) The not very uncommon chronic inflammation of the true hock joint which is characterised by pain; lameness; the emission of a creaking sound, especially when the animal begins to move after rest; often, if not always, by an increased amount of fluid in the joint; and by bony deposit about the part. The course of this disease in the horse appears to be identical with that of rheumatoid arthritis of man. As a great rule, it becomes developed only in old or at least adult horses which have done a good deal of hard work. It is only fair to say that some hocks which are perfectly healthy emit at times a similar creaking sound, which, therefore, cannot be regarded as peculiar to this disease; although, possibly, it may be a constant symptom. There is always a certain amount of stiffness in the joint, with, at times, marked lameness. In some cases, I have seen, while the horse was at work, sudden and most painful lameness occur, even to the extent of the animal holding up the affected limb off the ground, for a short time. This seizure would pass off after a few minutes' rest. The cause of it, I presume, was the detachment, from the diseased cartilage or from the bony deposit, of a particle which got between the articulating surfaces.

A horse with this disease in the hock may continue capable of a fair amount of work for years.

(2.) A similar though more acute form of inflammation of the stifle joint. I have met with one case of this in a van (light cart)

horse, which was about nine years old, and which was accustomed to do hard work. Figs. 101 and 102 show the two characteristic positions alternately assumed by him while at rest during the progress of the disease. He would raise the foot off the ground and keep the limb bent for several seconds as in Fig. 101, and then, seemingly because the muscles got tired, would lower the leg down, as in Fig. 102, to be raised again in about half a minute's time. Although the first steps taken were extremely painful,

Fig. 101.—Position assumed in rheumatoid arthritis of stifle.

the lameness, after that, was not very great. No exciting cause could be found for this case, which was in charge of Mr. F. B. Jones, M.R.C.V.S., of Leicester, and which ran a chronic course of some months before slaughter. There was gradual and well-marked wasting of the muscles of the croup and thigh of the affected side. Post-mortem examination showed an inflamed condition of the stifle joint, which contained a large amount of orange-coloured synovia. Its synovial membrane was orange-coloured, thickened, and covered with wart-like growths. The articular cartilages were partly worn away, and gave almost unmistakable evidence of rheumatoid arthritis. An apparently identical case in the near hind leg is described by Möller, who terms the disease *gonitis chronica sicca.*

I have no reason for supposing that this disease of the stifle

differed from that of the hock, except that it ran a more acute course. I would therefore be inclined to class them both under the one heading of rheumatoid arthritis.

(3.) An inflammation of the joints of the limbs of foals, without formation of pus, and probably connected with navel-ill (p. 532). In the two or three cases I have seen, the animals were from three to five months old. The first symptom noticed was decrease in power of movement from one place to another, and fatigue from comparatively slight exertion. There was gradual swelling of the joints, chiefly of the hock, stifle, knee and fetlock, and also swelling of the front of the cannon bones. The animals knuckled over more and more on all four legs until they were unable to walk, and could stand only with difficulty, so that they had to be destroyed. During the course of the disease, which lasted for about two months, they remained in good condition, their general health was apparently unimpaired, and the inflamed joints were not painful to the touch. The affected joints, by post-mortem examination, showed all the signs of rheumatoid arthritis, including the ivory-like deposit on the denuded ends of the bones. The age of the sufferers, the rapid progress of the disease, and its general attack on the joints of all four limbs, point, I venture to think, to infection as the cause, and justify the separation of this disease from the rheumatoid arthritis of adult and old horses, which form of inflammation has a close connection with injury or at least hard work. In these foal cases, the inflammation was persistent, and did not show any tendency to shift from one joint to another, which is a peculiarity of the inflammation of true rheumatism.

TREATMENT appears to be of no avail. A horse slightly affected should be put only to light labour. In the stable, he should be induced to lie down as much as possible.

Stiff Joints and Knuckling Over.

GENERAL REMARKS.—I shall confine my attention, under this heading, to the joints of the fetlock and knee.

We are all aware of the tendency which the pastern, especially of horses used at fast paces, has to become unduly upright from the effects of work. If we examine the joint, we shall find that this upright condition of the pastern is owing to inability to extend the joint to a normal extent; in other words, to bring the fetlock pad sufficiently near the ground. As the action of a limb in producing locomotion is due to the difference between its length when its joints are bent and its length when they

are straightened out; loss of "play" in the fetlock joint (or uprightness of pastern) is always followed by more or less loss of power of locomotion. In light saddle-horses which are sound and which have good action, the fetlock pad, in the gallop or fast canter, should come nearly down to the ground, as in Fig. 11 (p. 39), in which the pastern makes an angle of about 120° with the cannon bone. The maximum direct flexion (bending) of a healthy fetlock joint is shown in Fig. 103.

Fig. 102.—Alternate position assumed in rheumatoid arthritis of stifle.

As a rule, when inflammation from work or sprain (which are the cases we are at present considering) occurs in a joint sufficiently to permanently impair its power of movement, we shall find adhesions about the part, and, probably also, shortening of the ligaments which antagonise the extension of the joint, and which, in the case of the fetlock, check the descent of the fetlock pad. The further progress of these cases will generally be deposition of bone about the part, and the gradual conversion into bone of the fibrous structures and cartilages of the joint. A return to soundness is possible only when the articular cartilages (p. 269) have remained intact, and when any bony deposit which may have taken place, is so situated as not to interfere with the movement of the joint. At the same time, our surgical interference need not be restricted to obtaining soundness; but may also

be applied to increasing the usefulness of a limb. Not unfrequently the inflammation of the fetlock joint has been caused, or complicated, by fracture of one or both of the sesamoid bones, which are at the back of the fetlock, in which case there will be no hope of restoring to the joint its former healthy action.

TREATMENT.—In hopeful cases, namely those in which the articular cartilages are healthy, and no deposit of bone interferes with movement, the problem is the same as that which the human surgeon has in restoring normal mobility to an elbow which, on recovering from a dislocation, has remained at rest in a bent position for too long a time, but without suffering from diseased changes beyond the formation of adhesions. In this case, the doctor may proceed to forcibly extend the joint, so as to break down the adhesions then and there, or may get his patient, by working dumb bells or Indian clubs or by other exercises, to gradually straighten out the fibrous bands that form the adhesions, and to lengthen the contracted ligaments. In slight cases, and especially with foals, I would follow Möller's advice to obtain the necessary obliquity of pastern by lowering the heels, and if that did not do, by using a long-toed shoe (Fig. 104), which would naturally increase the leverage. In bad cases, calkins of the form shown in Fig. 4, should be used with the long-toed shoe, and lowered from time to time in accordance with the descent of the fetlock. The effect of lowering the heels would be increased by using tips, or by employing shoes which are thick at the toes and thin at the heels. Möller, in his work on veterinary surgery, describes the treatment of foals which knuckle over, as entirely successful by forcible extension, after the animal has been cast, and then keeping the pastern in proper position by carefully padded splints, or by a special apparatus, such as that of Friebel or Brunet, either of which could be obtained from a veterinary instrument maker. Major Blenkinsopp and Colonel Nunn, A.V.D., have performed many experiments in restoring mobility to stiff fetlock joints by forcible extension while the patient has been under the influence of chloroform, the employment of which, or of ether, is a necessity for overcoming the natural resistance of a grown-up horse. For this object, the action of the drug should be pushed so as to obtain complete muscular relaxation. The after-treatment consists of bandaging with cotton wadding (p. 45) and in massage (p. 664). For further information on this subject see "The Veterinary Record," 21st December, 1896, Eccles's "The Practice of Massage," and Möller's work. Stiffness of the knee may be similarly combated.

Fig. 103.—Extreme direct flexion of fetlock joint.

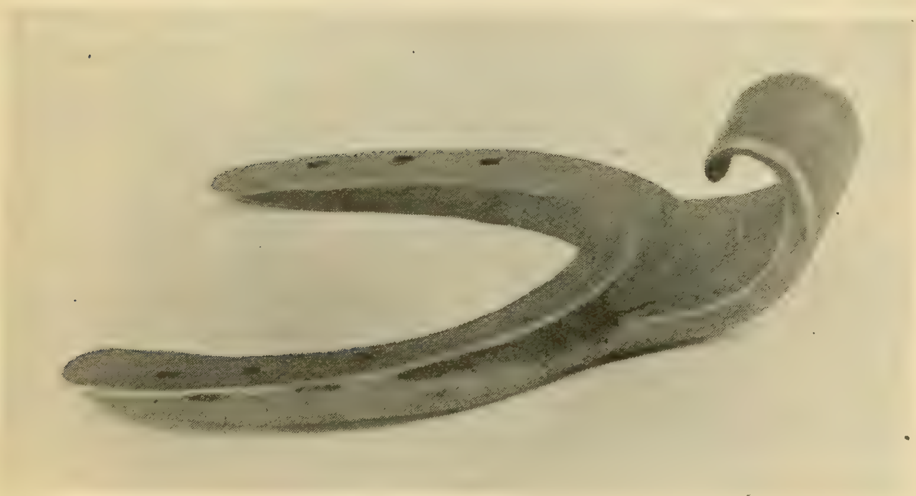


Fig. 104.—Long-toed shoe.

Sidebones.

NATURE.—Sidebones is the term used to express an ossified condition of the lateral cartilages. The ossification may be partial or complete, and may affect both cartilages, or only one. The lateral cartilages are plates of cartilage mixed with fibrous tissue which, on each side, are attached to and placed above the wings of the pedal bone. We may look upon them as cartilaginous and fibrous prolongations, above and to the rear, of the wings of the pedal bone. Fig. 105 gives us a representation of a pedal bone from which the lateral cartilages have been removed; and Fig. 106, that of the same pedal bone with these cartilages intact. In Fig. 107, which is a transverse and vertical section of a horse's foot, the lateral cartilages can be seen as white curves. Each cartilage in an ordinary saddle-horse is about 3 inches long, $\frac{1}{4}$ inch in thickness, and is about $1\frac{3}{4}$ inches high at the end of the wing of the pedal bone, behind which it projects for about $1\frac{1}{2}$ inches. These cartilages, which are peculiar to the horse family, are attached to the plantar cushion (Figs. 61 and 70), which is a fibrous and more or less elastic body that acts as a buffer between the frog and the bones which are above it. The lower part of the plantar cushion is covered by the sensitive frog, which is a membrane that secretes the frog. The lateral cartilages are more largely developed in the fore feet than in the hind feet. When these cartilages are ossified, they usually present more or less the appearance shown in Figs. 108 and 109. Sometimes only the front part of the cartilage (at the quarters) becomes ossified, as in Fig. 110, in which case the cartilages at the heels preserve their elasticity.

OCCURRENCE.—Sidebones are almost always confined to the fore feet; and in the majority of cases affect only cart-horses. I think I may say that at least 50 per cent. of heavy draught animals in large towns in England and Scotland suffer from them. The outer cartilage is more frequently affected than the inner; and, according to Lungwitz, the near fore foot, than the off fore. Sidebones are rarely seen in young horses which have not been put to work.

CAUSES.—The chief causes of sidebones appear to be: (1) deprivation of frog pressure; and (2) injury. High calkins, the use of which is almost entirely confined to cart-horses, deprives the frog, to a great extent, of the natural support which it derives from

Fig. 105.
Pedal bone
with the lateral
cartilages removed.

Fig. 106.
Pedal bone
with the lateral
cartilages intact.

Fig. 107.—Rear view of transverse and vertical section of horse's foot.

the ground. Hence, the plantar cushion is forced further down than it would be, if the frog were supported; and strain is put on the lateral cartilages, with the frequent result of inflammation and ossification. The nature of the work which cart-horses do, also, renders them liable to suffer from injury to the lateral cartilages of their fore feet, by their drivers carelessly letting down the shafts of carts, and by other horses treading on their coronets when ploughing. Concussion cannot be a prominent factor; for if it were, this disease would be particularly frequent among cab horses and fast trotters, which, however, do not often suffer from it. Among saddle-horses, one kind of foot is not more prone to sidebones than another, apparently because sidebones in them is almost always produced by injury

The fact that injury plays a large part in the production of sidebones, is shown by the frequency of this disease in horses imported into India from the Colonies; the evident cause being tread from over-crowding. In such cases of sidebone, the cartilage on the outside quarter is the one which is usually affected. In these instances, I have often noticed that the ossification was confined to the outside quarter, high up on the coronet, while the cartilage of that side at the heel still retained its elasticity. I have known sidebone caused by overreach.

The greater liability to contract sidebones shown by the fore legs, as compared to the hind ones, appears to me to be chiefly due to the fact that the lateral cartilages of the former are more largely developed and are more exposed to injury than those of the latter.

SYMPTOMS.—The ossification, whether local or general, can be readily detected by pressing the coronet, just above the heels, and along the quarters (Fig. 111), with the fingers and thumb. The cartilages, naturally soft and yielding, will, when ossified, be hard and inelastic. In the early stage, there will be heat and tenderness, without special hardness, which will become gradually established in the part with the development of the disease. The ossification, when it occurs on, and is confined to, the quarters, may be mistaken for ringbone, from which it can be distinguished by the fact of its standing out as a ridge, clear from the short pastern bone. If lame, the horse goes "short," on the toe, and in a style of action which somewhat resembles the gait of navicular disease, but is not so quick in the removal of the foot from the ground; in fact, it is a "stumpier" (if I may be allowed the expression) method of progression. If sidebones be present, there will be little difficulty in deciding the point. If the cartilage of only one side is affected, the animal will generally "dish" the

leg either outwards or inwards, as the case may be, so as to relieve the affected side.

The pain in cases of sidebone is due to the soft tissues being

Fig. 108.—Pedal bones with ossified lateral cartilages (sidebones).

compressed between the newly formed bone and the hoof. Not only does the ossified cartilage refuse to accommodate itself to

Fig. 109.—Pedal bone of near fore foot, with the outer lateral cartilage ossified, and the inner one removed.

the movements of the neighbouring soft structures; but it is also larger in size than it was before the bony change took place.

GRAVITY.—Sidebones in the hind feet seldom cause lameness; and in young horses they are much more serious than in mature

animals, as they will probably become better developed in the former than in the latter.

The shape of the feet is a very important factor in the gravity of this disease; because sidebones, even in the fore feet of cart horses are, as a rule, of little consequence, provided that the feet are well-shaped and the heels open; but if the feet are narrow and their heels contracted, the presence of sidebones in them should be regarded as a serious defect, even if the horse goes sound; for in this case, he will in all probability become lame later on, from the ossified condition of his lateral cartilages. Fig. 108 shows the presence of largely developed sidebones in a draught horse which had good open feet, and which remained free from lameness up to the time of his death by an accident. I obtained the particulars of this case from Mr. J. S. Barber, M.R.C.V.S., who had charge of it.

The case is different with saddle and light harness horses; for the faster the pace, the more objectionable will be the stiffness which is inseparable from the fact that the once elastic cartilages have become transformed into bone. Such animals will, however, be often able to do a good deal of useful work if kept on soft ground, and are not exposed to the effects of concussion, as in jumping or in fast trotting on a hard road. It frequently happens that although a horse with sidebones may go decidedly lame after extra work, a few days' rest will set him all right, for the time being, except for the chronic stiffness.

HEREDITARY PREDISPOSITION is well marked in this disease. During the seventies, eighties and early nineties, there was a steady increase in sidebones among cart horses in England, but since then, an equally steady decrease has set in, owing to the disfavour with which the authorities of English agricultural societies regard this ailment. The more lenient view taken in Scotland has been productive of very disastrous results.

TREATMENT.—With the object of relieving the lameness, we should stop work; lower the heels, so as to obtain frog pressure; and thin the horn below the sidebone, by the rasp and drawing knife. We may blister so as to hasten the process of ossification, on the completion of which the inflammation will cease. Neurotomy is indicated if the lameness proves incurable by other means. When working a horse with sidebones, it is well to use a heart-shaped bar shoe (Fig. 52), so as to obtain pressure on the frog.

Colonel F. Smith recommends the practice of giving mechanical relief from the pain of sidebones, by isolating the portion of hoof which covers the inflamed cartilage, from the remainder of the horn. This he does by making a groove through

the horn at right angles to the longitudinal axis of the foot, beginning close to the coronet at a point immediately in front of the inflamed part, and terminating it on the ground surface of

Fig. 110.—Sidebone on outside quarter of near fore.

the foot; and a similar groove, commencing at the coronet just in rear of the seat of inflammation, sloping downwards and forwards in the direction of the fibres of the wall. Both grooves should be

Fig. 111.—Feeling with thumb on off fore foot, for sidebone.

cut through the horny wall, so that the isolated portion may be able to yield to the pressure caused by the inflamed condition of the involved tissues.

LEGAL ASPECT OF SIDEBONES.—This disease has been decided in "Simpson v. Potts" (see Oliphant's "Law of Horses") to be an unsoundness in a mare which, at the time, was lame on that account. In "Hussey v. Coleman" (Salisbury County Court, 23rd Feb. 1859; see "Veterinarian" for 1859, page 291), which was for breach of warranty given with a mare that was subsequently found to have had sidebones, His Honour, when putting the case before the jury, said: "If at the time of sale there were the seeds of disease in this mare—if the membranes were affected—if the cartilage was partly ossified, even though it could not be seen, it would be enough for the plaintiff's case, and would be a breach of warranty on the part of the defendant." The jury returned a verdict for the plaintiff.

A cart-horse suffering from this ailment, might be passed "practically sound," provided that he was not lame, and that he had good open feet.

CHAPTER XII.

HERNIÆ (*Ruptures*).

GENERAL REMARKS—ACUTE INGUINAL HERNIA—CHRONIC INGUINAL HERNIA—HERNIA AT THE NAVEL—VENTRAL HERNIA—OTHER FORMS OF HERNIA.

General Remarks.

THE most of this chapter has been compiled from the writings of H. Bouley, Signol, Peuch and Toussaint, and Möller.

DEFINITION AND NATURE.—A hernia is a tumour formed by the escape of an internal structure out of the cavity which usually holds it. I propose to limit my remarks in this chapter to herniæ which take place out of the abdomen. These so-called ruptures are usually contained in a sac formed of peritoneum (p. 284) which gets pushed through the opening out of the abdomen. The tumour is said to have a neck, when the opening through which it escaped, is smaller than the transverse diameter of the tumour. If a hernia occurred through an accidental wound which had involved the peritoneum as well as the wall of the abdomen, the contents of the hernia, instead of being enclosed in a sac of peritoneum, would probably become exposed to view, as might happen if a horse was staked. Although, for convenience sake, the term "rupture" is applied to all kinds of herniæ; strictly speaking it is incorrect to do so, except when referring to those which have escaped through an accidental opening.

The herniæ which we are at present considering, generally consist of a portion of the small intestine, of its connecting membrane (p. 284), or of both. Constriction round the neck of a hernia, if unrelieved, may cause death from mortification brought on by stoppage of the circulation. Even if it be but slight, it will, if prolonged, give rise to thickening of the part, and to the formation of adhesions. In any case, the contents of a hernia being

deprived of their natural protection, will be specially liable to injury from accidental causes. When serious interference with the circulation of the contents of the tumour is caused by constriction at the neck, the hernia is said to be *strangulated* or *acute*. It is called *chronic*, if it remains unrelieved for a long time without giving rise to acute symptoms, or it may be *intermittent*. An acute inguinal hernia is seldom, if ever, intermittent; for it is of such a nature that it hardly admits of spontaneous relief. A hernia may be irreducible on account of the bowel having become firmly adherent to the outside covering of the sac, as might happen in old standing cases, in which there was interference with the circulation of the part, though short of actual strangulation.

ANATOMY.—The interior of the body of the horse forms a large cavity, which is divided across by a muscular partition (the *diaphragm*, or midriff), into two parts, the thorax and the abdomen. The former contains, among other organs, the lungs and heart; the latter, the intestines, stomach, liver, spleen and bladder. The interior of the abdomen is lined by a membranous bag (the *peritoneum*) which covers the organs contained in the abdomen, and which forms folds that serve as ligaments (1) to connect the intestines together, and (2) to suspend them from the roof of the abdomen. The connecting layers of peritoneum are called *omentum*; the suspending ones, *mesentery*.

There are two openings (the *inguinal canals*), one on each side, from the abdomen into the scrotum. They are situated in the groin, close to the stifle, are about 3½ inches long, and run downwards, backwards, and inwards. Their upper opening (superior inguinal ring), which is smaller than their lower opening, is, on each side, a little in front of the lower and front edge of the floor of the pelvis (the pubes), and can be readily felt with the fingers, by reason of the prominence of its front edge, if the hand be passed through the anus into the bowel. In a stallion, a pouch of peritoneum on each side, lines the inguinal canal and the scrotum, and at its lower end gives lodgment for the testicle, the cord, blood-vessels, and nerves of which pass upwards through the inguinal canal into the abdomen. This pouch or bag of peritoneum forms the *tunica vaginalis* (Fig. 112). In health, the small intestine lies loosely over the inguinal canals, but does not enter them. Under circumstances which cause hernia, the bowel or the omentum, or both, may be forced into, or may slip through one or both inguinal canals, and to a greater or less extent, into the scrotum.

The *navel* is the site of the opening into the abdomen, through which the *navel-string* that connected the fœtus to the mare, passed. Shortly after birth, the navel-string becomes divided, either accidentally or intentionally, and the opening, under healthy conditions, soon closes up. The attempt at closure may, however, be incomplete or defective from injury, ill health, or hereditary predisposition, and a hernia at the navel may ensue.

Acute Inguinal Hernia.

An inguinal hernia is the passage through one of the inguinal canals of a loop of intestine (Fig. 112), or a portion of omentum, or of both. It may only just show through the inguinal canal, or may descend low down in the scrotum (when it is termed by some "scrotal hernia"); although it seldom comes down as low

as the testicle. In entires, the contents of an inguinal hernia are usually intestine; in geldings, omentum. Hence, cases in the latter are as a rule much less grave than in the former.

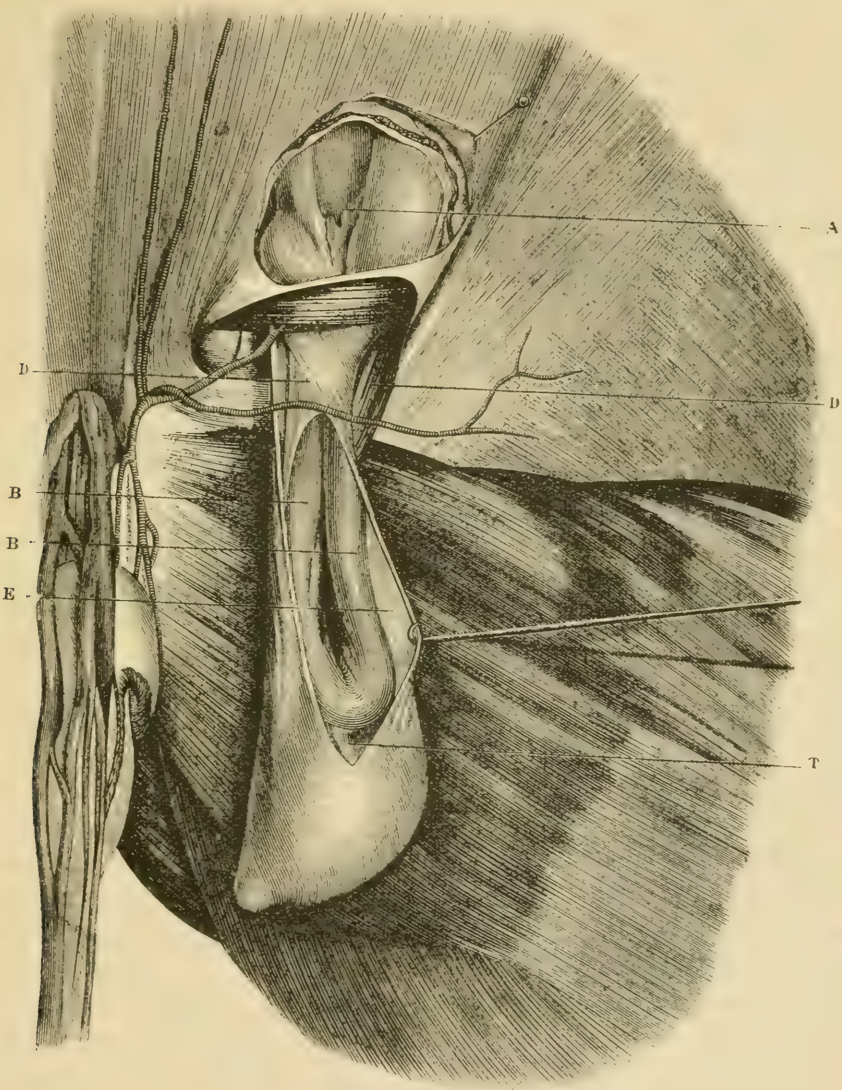


Fig. 112.—Strangulated Inguinal Hernia. (Borrowed from Peuch and Toussaint's "Chirurgie Vétérinaire.") A, coils of intestine. B B, loop of escaped intestine. D D, point of constriction. E, interior of scrotum (*tunica vaginalis*), in which the testicle (T) lies.

The causes are: excessive contraction of the abdominal muscles (as during violent exertion, or when struggling) by which a portion of the contents of the abdomen is forced through the inguinal canal; shock from falls, etc.; or the fact of the inguinal canal

being naturally unduly wide. The superior inguinal ring becomes dilated if the hind leg of its side is extended backwards and outwards.

PREDISPOSITION.—Climatic heat is a strong predisposing cause, by its relaxing effect on the tissues, which in entires suffering from inguinal hernia, is aided by the fact that in hot countries the testicles hang lower down, than in temperate or cold ones, and thus increase the pressure of their cords on the respective inguinal canals. H. Bouley states that inguinal hernia is more common in hot weather than in winter. Inguinal hernia is not uncommon among entire horses; but is extremely rare among geldings; for the cord, when freed from the weight of the testicle, ceases to exert its customary pressure on the interior surface of the inguinal ring, which it, on retracting, also appears to help in blocking up. In mares, the blood-vessels (of the udder) which, on each side, pass through the inguinal canal, are so closely surrounded, at the superior inguinal ring, with folds of peritoneum, that neither the intestine nor its membranes can get through that opening, without these protecting folds being previously torn asunder. Consequently, mares hardly ever suffer from inguinal hernia. There may be congenital predisposition which is not sufficient to give rise to it without an exciting cause. Signol states that mules are more liable to this form of hernia than donkeys. It occurs more often on the left side than the right; because the folds of the small intestine occupy chiefly the left flank.

THE GENERAL SYMPTOMS OF ACUTE INGUINAL HERNIA are: suddenness of attack; colicky pains which rapidly increase in intensity; movements indicative of trying to relieve the hernia, such as arching the back, repeatedly stretching the muzzle forwards and upwards and then bringing it down, lying on the back, or sitting on the ground like a dog; pawing the ground; and breaking out in patches of sweat. H. Bouley states, that, if the hernia remains unrelieved, the intestinal pains will disappear between the fifteenth and twentieth hour after the symptoms of uneasiness have commenced, on account of mortification, and consequently insensibility, of the bowel setting in. The local symptoms of acute inguinal hernia are: thickening of the cord, the component parts of which will be found to be bound together and incapable of being freely separated from each other by the fingers; filling, after a few hours, of the lower part of the scrotum with fluid from the congested blood-vessels; coldness of the scrotum from arrest of circulation; drawing up of the testicle; and, at first, pain on manipu-

lation of the part, succeeded, towards the end, by insensibility. We may feel for the presence of the hernia by passing the fingers of one hand along the course of the cord towards the inguinal canal, and the first and second fingers of the other hand through that canal from the inside after having put the hand, previously anointed with oil, into the rectum. In health, the tips of the fingers of the two opposing hands can be brought almost to touch each other with only the skin of the scrotum between them. In hernia, a greater amount of tissue proportionate to the progress of the ailment, will be interposed between the fingers. In case of doubt during this examination, the same procedure should be tried on the other side, so as to be able to compare the two results of touch.

CHANCES OF RECOVERY FROM ACUTE INGUINAL HERNIA.—If unrelieved, the patient will die within, as a rule, twenty-four hours of the first appearance of symptoms of pain. According to H. Bouley, the case will probably terminate fatally, if treatment be delayed beyond the fifteenth hour.

TREATMENT OF ACUTE INGUINAL HERNIA.—Owing to the great danger of allowing inguinal hernia to remain unrelieved, we should in all cases of colic affecting entires, at first examine the patient for this accident. There is so little probability of being able to return the escaped loop of intestine into the abdomen while the horse is standing up, except, perhaps, during the first hour or so, that we should not lose much time making the attempt. Of course, the longer the delay, the greater will be the difficulty in returning the tumour, on account of the continued transudation of watery fluid from the imprisoned blood-vessels; to say nothing of the mischief going on in the part. If we fail to effect our purpose while our patient is on his legs, we should put him down on a soft bed, with his hind quarters higher than his head, which, for instance, may be placed down an incline. If possible, we should bring him under the influence of chloroform, so as to produce muscular relaxation, which will be a great aid to reducing the hernia. We should then turn the horse on his back, prop him up with, for example, trusses of straw, separate both hind legs, draw the hind leg of the side on which the hernia has taken place backwards and outwards, so as to aid the return of the tumour by dilating the inguinal canal, and proceed to draw the intestine into the abdomen by taxis, which is the term applied to the "process by which parts that have left their natural situation are replaced by the hand without the aid of instruments" *(Stormouth).* If the symptoms of pain have not continued longer

than six hours (to adopt H. Bouley's judicious limit), we should seek, by manipulating the hernia, to reduce its size and to push it back into the abdomen, while gently pulling it down (the animal being on its back) from the inside with the other hand, or while having this done for us by a capable assistant. Colonel Nunn, who has had much experience of this accident in India, points out to me that the return of the loop is greatly facilitated at this stage, by removing its contained gas and fluid by means of an aspirator (p. 79) or hypodermic syringe under antiseptic precautions. By doing this, he has had but little trouble in returning the escaped portion of the intestine, without having to resort to the somewhat hazardous operation of opening the scrotum; although subsequently there is generally some difficulty in keeping it in the abdomen. There is little or no danger in using an aspirator in this manner. If our efforts prove unsuccessful, we should open the scrotum and its lining membranes, by an incision, from front to rear, over the tumour, taking great care not to wound the bowel. If our chief object is to save the life of our patient, we should remove the testicle (supposing that the animal is an entire), which we can do by torsion (p. 654) or by the écraseur (Fig. 113) The removal of the testicle of the affected side not only facilitates the returning of the imprisoned parts; but also greatly diminishes the danger of a recurrence of the hernia. If, however, the horse is useful only for his procreative powers, we may leave the testicle intact, with the knowledge that a good recovery is very doubtful, owing to the great difficulty of preserving the integrity of the testicle after having exposed it. Even if we are successful in this, the animal will in future be specially liable to this form of hernia. With the escaped parts exposed to view and touch, we shall be in a more favourable position than we occupied before opening the scrotum, to decrease the volume of the tumour by carefully applied massage, and by drawing off as much of the watery and gaseous contents of the tumour, as we can conveniently do with an aspirator. Having got the tumour as small as possible, we may again try to reduce it by pulling from within and pushing from without. When we are endeavouring, from the inside, to draw the contents of a strangulated hernia through the inguinal canal, we should take hold of both ends of the loop of intestine; for we cannot free the loop by pulling at only one of its ends. In manipulating the bowel, we should be most careful not to injure it by using undue force, and should remember that the longer it has been strangulated, the easier it can be torn. The progress of the destructive changes in the loop of intestine, will be marked by the red of early congestion passing into the purple of inflammation, and ending in the blackness of mortification.

If we are still unsuccessful, or if the advanced stage (say, after the sixth hour) of the strangulation precludes any attempt at forcible manipulation, we should lose no more valuable time; but should at once proceed to ease off the constriction, which we may do with a specially-made knife (a herniotome) or probe-pointed bistoury. To facilitate matters, while keeping the patient on his back and under the influence of chloroform, we should, as advised by H. Bouley, attach a rope to the pastern of the hind leg of the affected side, and draw that limb well away from the body and bring it forward as much as possible, so as to save the operator from being incommoded by the struggles which the animal will make, even when under chloroform, and to produce muscular relaxation of the part. To further secure the limb, we may attach the end of the rope to some fixed point, such as a ring in a wall, post, or heavy cart. The best position for us to occupy, is on our knees, behind the animal. The operation of cutting the structure

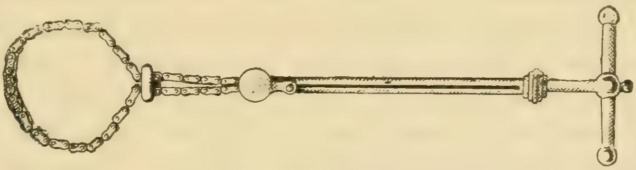


Fig. 113.—Ecraseur.

which causes the strangulation, is greatly simplified by knowledge of the fact discovered by H. Bouley, that the constriction is not, as we might have thought, at the superior inguinal ring; but about an inch below it. By making an incision at that spot, we avoid the great danger there would be to a recurrence of the hernia by our having increased the size of the superior inguinal ring. The form of herniotome recommended by H. Bouley is a straight probe-pointed knife, the cutting edge of which is only of small extent and situated near the point. We should bear in mind that the loop of bowel will be on the internal side of the cord of the testicle. Having first carefully found out with the index finger the exact position of the constricted spot in the inguinal canal, and having the edges of the wound held open by an assistant, we should place the flat of the cutting surface of the herniotome or bistoury on the pad (the side opposite to the nail) of the index finger of the left hand, if the hernia be on the left side, and *vice versâ*, with the edge turned backwards and the entire end of the blade overlapped by the skin of the finger, so as to prevent it inflicting any accidental injury on the tissues. The other fingers of the hand should grasp the handle of the instrument, and the thumb should keep the flat of the blade pressed

against the pad of the index, which should then be passed into the scrotum and up to the constricted point in such a manner that the flat of the knife will be next to the outer side of the inguinal canal, the intestine next to the inner side, and the index finger between the two. The knife should now be made to revolve on its back, so as to bring its blade at right angles to the flat of the index finger, in which position it will cut outwards through the tightly stretched tissues that press against it. This, as a rule, will be sufficient to free the constriction, which in any case will require only a very slight incision. We should remember that an important artery (the posterior abdominal) passes along the inner side of the inguinal canal. If, after the operation, we find that we can pass the end of the index finger beyond the site of the previously existing constriction, we may feel certain that the knife has penetrated deeply enough. If we are unprovided with a suitable instrument, we may overcome the constriction by using an improvised one in the same manner, or even by the end of the finger. Having broken down the obstacle to the return of the bowel into the abdomen, we may, if necessary, gently aid the reduction of the tumour, by manipulating it from without and within, as previously described. All the preceding work on exposed tissues, should be conducted with the utmost regard to cleanliness, and as far as possible under antiseptic conditions (p. 70); and we should pursue the same course in our subsequent treatment. It would be well to withhold all food from the animal for at least twenty-four hours; although he should get a full amount of water in small quantities at a time. He should be brought on gradually to his usual allowance of food. If a sedative be deemed necessary, we may give him 1 oz. of chloral hydrate in a pint of water, or $\frac{3}{4}$ oz. of chlorodyne.

If the operation of freeing the constriction by means of the knife has been properly carried out, it will, after the intestine has been returned, act as an effective prevention to a relapse. The operation, if skilfully executed, is productive of far less danger, than the method of pulling and pushing the inflamed intestine. It should therefore on no account be regarded as a last resource.

After the bowel has been returned, it is the practice of many veterinary surgeons always to put either a straight or curved clam close to the animal's belly and immediately below the inguinal canal. Before doing this, it is well, as advised by Pfuscher, to give the tunica vaginalis (the membrane which, in the entire, forms a purse for the testicle on each side, see Fig. 112) and the cord a complete turn on their long axis, so as to help to close the opening. The clams are placed over the tunica vaginalis and the cord. "As the chief difficulty in applying the clams high is

occasioned by the outer skin and soft parts lying below it, I select a short but carefully-disinfected pair of clams, and make an incision through the skin, large enough to allow the clams to be pushed to the bottom of the wound, and to be just under the inguinal ring. The skin is then brought over them and sutured, thus retaining them in the wound. If neither fever, swelling, nor other disturbance is marked during the next few days, I allow the clams to remain in position for a week. On removal, healthy granulations will be found, unaccompanied by pus formation, and the wound heals in a short time" (Dollar's translation of Möller's "Veterinary Surgery"). These precautions will prevent the bowel or its connecting membrane from becoming exposed, in the event of its again descending through the canal. Removing the testicle or cutting down on the constriction, will, however, so far obviate the risk of a recurrence of the hernia, that we may dispense with the use of a clam, the presence of which will be apt to give rise to blood poisoning, on account of its unavoidable interference with the drainage of the part. A clam cannot, of course, be used, when we are trying to preserve the testicle. The action of the clam is to cause strangulation of the part imprisoned between its branches, with subsequent inflammation and union by granulation. To accomplish this, the pressure of the clam should be regulated, so as to effect adhesion without causing such rapid mortification that the clam would drop off before the opposing surfaces had united, in which case, the action of the clam would be nullified.

When deciding the question whether it was the disease or the treatment which had killed the patient in case of death after hernia has been reduced by taxis, we should remember that there have been many instances of recovery after the intestine had become almost black. If, before treatment, inflammation had advanced to such an extent as to suggest the probability that its action had weakened the strength of the tissues, the operation of freeing the constriction by means of a knife should be at once performed in preference to more hazardous efforts at reducing the rupture solely by manipulation.

Chronic Inguinal Hernia.

We may apply this term to inguinal hernia which is not necessarily followed by strangulation, and which consequently can exist for a long time without giving rise to acute symptoms. It is made manifest by a soft and generally painless swelling in the scrotum, which, if we, as advised by Percivall, grasp with one or both hands, softly but closely, and then let another person "cough" the horse, will be found to suddenly expand under

the effort, and to recede as quickly again. The practice known as coughing a horse consists in making him cough by compressing his larynx, with a finger and thumb, one on each side. This chronic form of hernia is accompanied by the transudation into the scrotum of a greater or less amount of serum, which, when in excess, causes dropsy of the scrotum (hydrocele). A certain degree of chronic inflammation set up in the part, will lead to thickening of the tissues, and to the formation of adhesions. The tumour sometimes attains an enormous size: in fact I have seen, in hot climates, the scrotum from this cause, hang down as low as the hocks. The tumour is liable to become engorged and consequently inflamed, in which case it will be accompanied by colic and other symptoms of distress.

Bonnigal in the "Recueil de Médicine Vétérinaire," 1892, mentions cases of chronic inguinal hernia of geldings in which the omentum (the connecting membrane of the intestines) after having descended through the inguinal canal, united with the wound in the scrotum, and thus caused uneasiness, pain, and disinclination to take exercise. The adhesions thus formed may give rise to a condition not very unlike scirrhous cord. In many instances, this adhesion does not in any way incommode the animal.

Probably the chief CAUSE of chronic inguinal hernia is abnormal size of the superior inguinal ring, under which condition, the intestine or its connecting membrane will be liable to descend into and through the inguinal canal without force being used, and consequently without much danger of strangulation being incurred. This form of hernia frequently exists at birth, continues during early youth, and disappears with age. It may be brought on by the calibre of the superior inguinal ring having been unduly enlarged by forcible distension, or by incision during an attempt to reduce an acute inguinal hernia. As in hot climates, chronic inguinal hernia is frequent among old entires, though rare among young ones and those in their prime (say, horses up to ten years of age); I cannot help thinking that in many of these cases, it is induced by the combined relaxing influences on the tissues, of old age and heat.

In the TREATMENT of cases of colic and uneasiness from engorgement of a chronic inguinal hernia, we may, while the patient is standing up, or more easily if he is on his back, unload the loop of intestine, and return it (or its connecting membrane) by taxis (p. 287). As advised by Peuch and Toussaint, we should not operate, unless acute symptoms set in, if the animal is less than fifteen months old; because the chronic inguinal herniæ of foals usually disappear with advancing age. We should also refrain

from operating if the tumour be harmless in its effects. If, however, it becomes so large as to seriously impair the usefulness of the animal, or if painful symptoms set in, we should, after having placed the patient on his back, try to return the tumour in the manner described for the treatment of acute inguinal hernia, after having removed the testicle (supposing the animal to have been an entire), and put on a clam close below the inguinal ring.

Hernia at the Navel (*Umbilical Hernia*).

This form of hernia is the protrusion through the navel, of bowel or of its connecting membrane. It is consequently situated in the middle line of the abdomen and can scarcely escape the observation of the most inexperienced person.

CAUSES.—Hereditary predisposition is well marked in this complaint. "It may exist at birth, but, as H. Bouley wisely remarks, this so-called congenital hernia may very probably be the result of the pulling which the navel-string underwent at the time of foaling. However it may be, umbilical herniæ usually occur during the first two or three months after birth; that is to say, while the opening at the navel is becoming obliterated, and the tissue at that place is becoming consolidated. They can, however, appear later, and may result from more or less violent strains done when the foals are jumping and playing. At other times, these strains are induced by intestinal irritation, accompanied by diarrhœa, or constipation with straining. But, however the strain may take place, the abdominal muscles contract and push the intestines towards the wall of the belly. Then, if they find an opening, or even a weak spot, like the ring of the navel while it is undergoing the process of becoming blocked up, they select it, and a hernia is produced" *(Peuch and Toussaint).*

SYMPTOMS.—This hernia, the situation of which clearly shows its character, may vary in size from that of a hen's egg to that of an ostrich's egg, or even bigger, and may be hemispherical or pear-shaped. The tumour, if pressed upon with the hand, especially if the animal is placed on his back, will disappear, to return, however, when the pressure is removed. If it be composed of intestine, it will be soft and elastic when the bowels are empty, and doughy when they are full of semi-solid matter. In any case, the tumour will feel more elastic when composed of intestine, than when formed of its connecting membrane, which, naturally, will not vary in consistence. If intestine be present, movements and abdominal rumblings may be detected in it. This hernia rarely gives rise to serious consequences; because its contents are com-

posed of large intestine (colon) and omentum, neither of which are in this position liable to become strangulated. It may, however, become engorged and inflamed from injury. Its existence naturally depreciates the value of an animal suffering from it.

TREATMENT.—Excellent results can be obtained in the treatment of this form of hernia, by the continued use of a truss which is kept in position by means of its attachment to a roller (Fig. 114). The following surgical treatment is recommended by Möller :—" The animal is cast, placed on its back, the hind legs bent and drawn outwards, the hair shaved from over the hernial sac, which is washed and rinsed with a disinfecting fluid. After complete replacement, the folds of the sac are gathered together in the direction of its long axis, and, beginning with one end, transfixed close to the abdominal wall with a slightly bent needle, provided with a strong sterilised double silk thread. The threads, when drawn through, are divided close to the needle, and the ends of the one half tied tightly together, whilst an assistant draws the sac gently upwards. The needle carrying the second half of the thread is again passed through the sac about $\frac{3}{4}$ of an inch from the first point of incision, and this section ligatured in a similar way. The same process is continued until the entire sac is ligatured. Should the animal struggle whilst the needle is being passed, the fingers of the left hand are placed on the umbilical ring to prevent the intestine protruding and being transfixed, or we should wait until the animal is again quiet. The entire sac is then once more rinsed with sublimate or carbolic solution, and the ligatures on both sides of the sac powdered with a mixture of iodoform and tannin (1 to 3)" (Dollar's Translation of Möller's "Veterinary Surgery").

When the hernia is very large (see Möller's "Veterinary Surgery"), we may adopt Siedamgrotzky's method of reducing the tumour, dividing the skin which covers it, paring the edges of the umbilical ring, and bringing them together with strong antiseptic cat-gut or strong antiseptic silk thread. We may then pare the overlying skin to a convenient size, suture its edges with similar cat-gut or silk thread, and finally cover the wound over with antiseptic cotton-wool and suitable bandages.

Ventral Herniæ.

The contents of these tumours consist as a rule of large intestine and omentum, and, in very rare cases, of an internal organ, such as the liver. The opening through which the contents escape is an artificial one in the wall of the abdomen, generally on the

left side and behind the ribs. The term, rupture, can therefore be appropriately applied to a ventral hernia. The sac of the tumour usually is formed of skin and the sheet of muscle (panniculus) by which the horse is able to twitch off flies and other objects that happen to alight on his shoulders and sides. These tumours as a rule are caused by internal injuries, and in straining when foaling. They sometimes attain to the size of a man's head or even larger. They rarely become strangulated, and

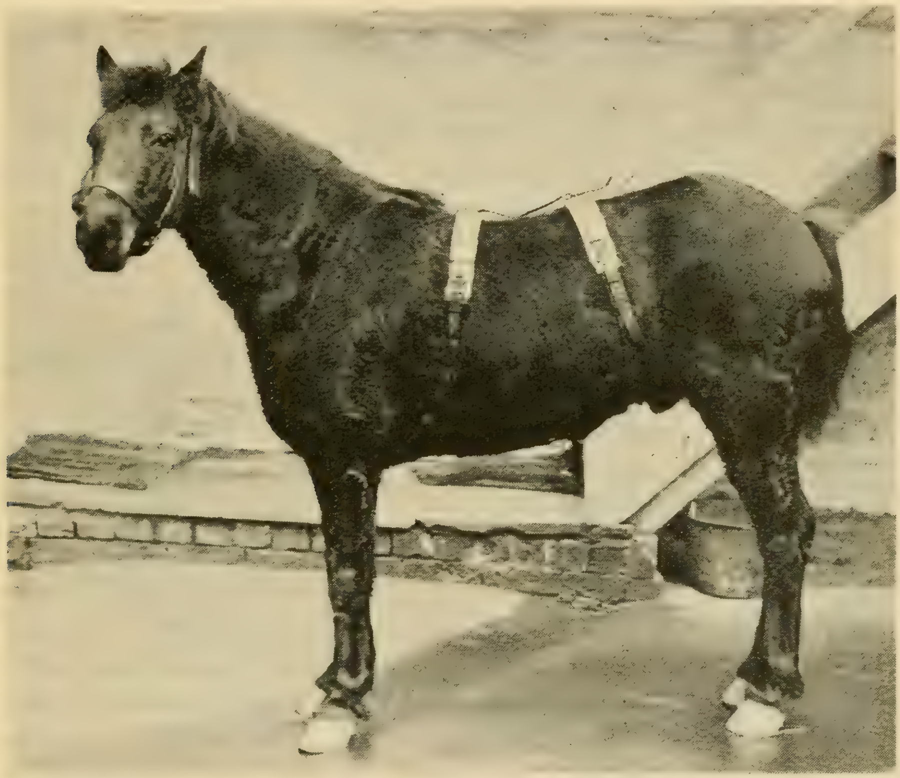


Fig. 114.—Truss for umbilical hernia.

consequently seldom interfere with the usefulness of the animal unless when wounded. Usually they had best be left alone. Their treatment is similar to that of umbilical hernia (p. 294).

Other Forms of Hernia.

The horse is liable to other forms of hernia (crural, diaphragmatic and pelvic), which are so rare, or so little amenable to treatment, that they need not be considered here.

CHAPTER XIII.

FRACTURES.

FRACTURES IN GENERAL—ANTERIOR ILIAC SPINE—BACK—BUTTOCK, POINT OF THE—CANNON BONE—FEMUR—HIP, POINT OF THE—JAW — LEG — NAVICULAR BONE — PASTERN BONES — PEDAL BONE —PELVIS—RIBS—FIRST RIB—SHOULDER BLADE—TAIL—THIGH—TIBIA—TRAPEZIUM.

Fractures in General.

As fractures of the bones of the horse are, as a rule, but little amenable to treatment, owing to the difficulty of reducing and "setting" them, and of keeping the patient at rest, I shall content myself with describing the comparatively small number of these accidents which may be successfully treated, under ordinary circumstances.

A fracture may occur straight across the bone; obliquely; or longitudinally (lengthwise).

The chief VARIETIES OF FRACTURES are as follows:—

1. *Simple fracture*, when the bone is broken, without an external wound communicating with the seat of injury. As the periosteum—the covering membrane of the bone—is generally very strong in the horse; it often keeps the broken surfaces together, and thus prevents, for the time being, the fracture becoming apparent.

2. *A compound fracture* occurs when the broken bone communicates with an external wound.

3. When the bone is broken in several pieces, the injury is called a *comminuted fracture*.

4. An *impacted fracture* takes place, when one broken end of a bone is driven into the other broken end.

Comminuted fracture and impacted fracture, may be either simple or compound.

COURSE OF UNION.—According to Erichsen the following are the stages of the union of a broken bone. (1) The period of inflammation and

exudation lasting for about three days. (2) The external and (if the bone be hollow) internal encasing of the broken ends by soft material, which is completed in about the twelfth day. (3) The conversion of the soft encasing material into bone, which holds the parts together for the time being, and which is called the provisional callus. This stage will be finished at about the end of a month. (4) The formation, between the broken ends, of material which, on becoming converted into bone (definitive callus), completes the union of the separated parts, and which commences after the provisional callus has become sufficiently strong to check movement in the part. This process would probably require a couple of months for its full accomplishment, but it cannot take place if movement in the broken ends of the bone be set up from time to time. (5) The absorption of excess of callus, which requires several months to complete its course, and even then is almost certain to leave more or less roughness and thickening of bone.

The foregoing detail holds good in compound fracture, in which repair is generally delayed by suppuration.

FIBROUS UNION OF FRACTURE AND FALSE JOINT.—In fibrous union, the reparative material which is formed between the broken ends, instead of becoming converted into bone, is changed into fibrous tissue, usually on account of the disturbing influence of frequent movement. In false joint, fibrous tissue forms a capsule round the broken ends, which, by rubbing against each other while being thus held together, make a more or less effective joint.

GENERAL SYMPTOMS OF FRACTURE.—Sudden and great lameness; deformity of the part with or without abnormal mobility; pain; and fever. Grating (crepitus) may be felt, or even heard when the broken surfaces rub together. When there is fracture without displacement, there is often very little to show what is amiss as long as the animal is kept quiet. The symptoms, then, are somewhat similar to those of violent sprain. Here, the absence of injury to other parts will generally help us in our investigation. When feeling the part, great care should be taken not to separate the divided ends, if there be no displacement; nor to convert a simple fracture into a compound one, which is far more dangerous and more difficult of cure, by reason of the entrance into the wound of putrefactive germs from without, as well as by the increased extent of the injury.

GENERAL TREATMENT OF FRACTURES.—If there be displacement, the broken ends of the bone should be brought together, and the part placed in as natural a position as possible. If there be compound fracture, the wound should be thoroughly syringed out with some suitable antiseptic (p. 67), which will disinfect it as well as clean it. Drainage (p. 75) should be secured, and the wound should be treated antiseptically (p. 74) until it becomes healed. All completely separated fragments of bone, in the case of comminuted compound fracture, should be removed; but those which are only loosened, and which are still connected to periosteum, should be left undisturbed, or gently ad-

justed into their proper position if necessary. The animal should have as complete rest as possible, slings (p. 680) being employed if they can be obtained, and if the nature of the injury admits of their use. Sawdust is a capital material for bedding in fractures, as it affords good foothold, and allows the animal to readily change the position of his limbs.

As healthy union cannot take place unless the part be kept at rest, we may, in order to obtain that condition, use various local means, such as splints and bandages. Splints aid in checking movement, and also assist to prevent deformity from the broken parts remaining out of position for a lengthened period. The great danger in their use is the setting up of unequally distributed pressure, which, if prolonged, would be liable to give rise to inflammation and even death of the part. They may be made of sole leather, gutta percha, strong paste-board, and thin wood; and in cases of emergency, bundles of brushwood, whips, sheet iron, or even strong iron wire can be employed for this purpose. They should be cut so as to prevent them interfering with any prominences near the part, and, also, to keep exposed for treatment, any wound which may have been inflicted at the time of the accident. Before putting on splints, any inequalities on the surface of the part should be filled up with some soft, elastic material, such as cotton wool. Tow, moss, hay or grass can also be used. The following procedure with splints may be adopted in case of fracture of any of the bones below the elbow or stifle:—After having placed the parts in position, wind round the leg at least six thicknesses of cotton wadding, as in sprain (p. 45). Place along the direction of the limb two splints, each of them being a little less than half the width of the circumference of the surface on which they are put. Then apply over the splints an "immovable bandage," which will afford firm support and which can be easily removed by cutting it through with a pair of scissors, at the space between the splints on each side. This bandage may be of strong calico, about 3 inches broad and 6 or 8 yards long, and can be made adhesive by soaking it in a thick mixture of starch, paste, "charge composition" (p. 48) without the mercurial ointment, or even common pitch. Evenly distributed and abundant padding is of the highest importance when arranging splints. Care should be taken that the bandage should not be put on too tightly at first; although, to be of benefit, it must afford firm support. "The Surgeon should always bear in mind that in the treatment of a fractured bone, he can do nothing to promote its union, beyond placing it in a good position. Nature solders the bone together; and the less the Surgeon interferes the better. But it is requisite to examine the limb from time to time, and especially about the

second or third week, when bony union is commencing, in order, if necessary, to correct displacement" (*Erichsen*).

With respect to the use of slings in fracture of the leg, we must not forget that although it allows the patient to rest the affected

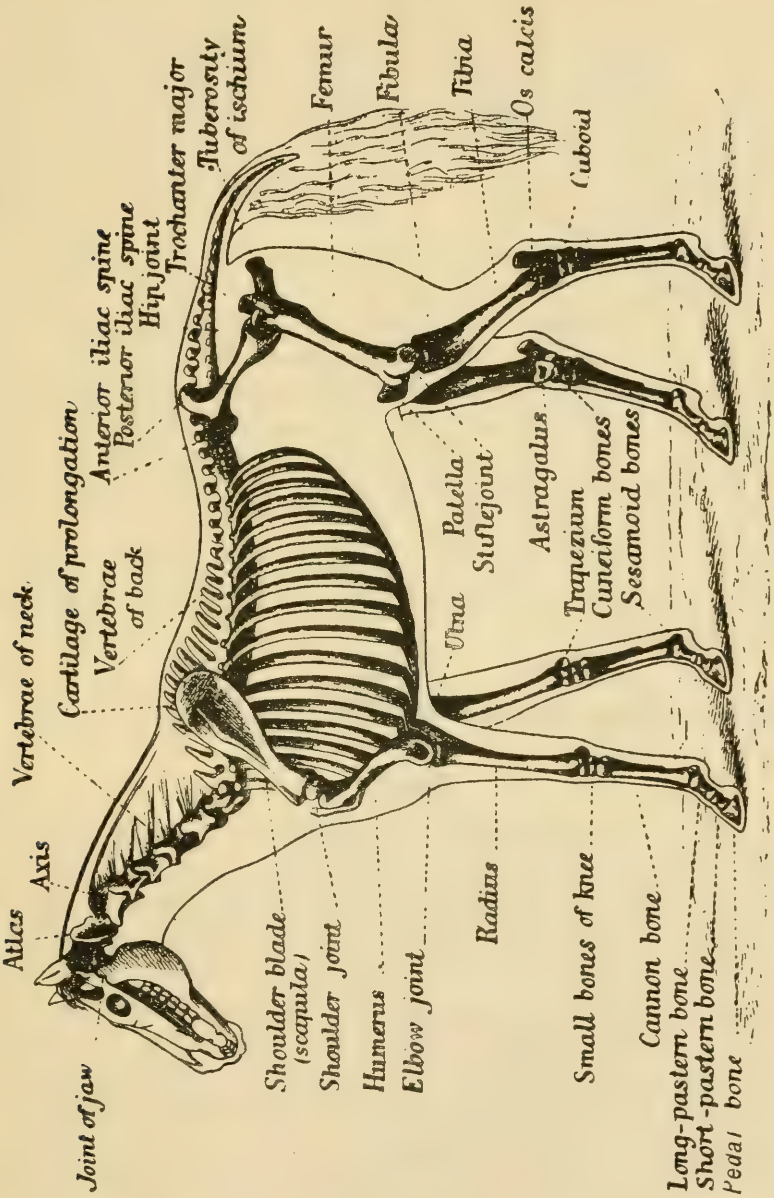


Fig. 115.—Skeleton of horse.

limb, it does so at the expense of the other leg, the foot of which, if the erect position be maintained for a long time, will be liable to become affected with laminitis (p. 189), which is nearly as bad as a broken leg. If possible, slings should not be employed for

longer than a month. After the symptomatic fever has passed off and repair has made fair progress, say, in ten days, the sufferer can generally be trusted, without slings, to take care of the injured part, especially when he has a deep, soft bed under him, and when he has been in the meantime, kept low on green grass and carrots.

Splints and bandages need not remain on longer than six or seven weeks, by which time the reparative material will, as a rule, have become sufficiently solid to keep the broken ends together without their aid; although the animal, in the case of a fractured limb, should not be taken out of his stable for another month and a half. Usually, it would not be safe to begin work sooner than five months after the accident.

A mild aperient, such as a pint of linseed oil, and laxative food, will be of service. The broken bone will often not unite until the animal gets a change of food and plenty of green-meat. If he suffers from great pain, in the first instance, we may give 1 oz. of chloral hydrate in a pint of water. If, after union has taken place, there remains a large deposit of bony material which was thrown out for the repair of the injury, the part should be blistered two or three times with biniodide of mercury, or deeply fired with a pointed iron at different places.

The most common fractures are those of the point of the hip, the pastern bones, and the tibia (the bone which lies between the hock and the stifle).

Anterior iliac spine.—See "Point of the hip," p. 308.

Back.

By the term "broken back" is meant fracture of one of the vertebræ of the loins or back. The former accident is almost always fatal; although recovery after the latter not very unusually occurs on account of the support afforded by the ribs in keeping the divided ends together. If the resulting paralysis be but slight, there is every hope that the case will do well; but if the loss of muscular power be complete, recovery will be out of the question. If, after a horse has got up after having had a fall, there be reason to believe that he has broken his back without displacement of the fractured ends, he should if possible be kept on his legs, so as to prevent him getting down; for the effort in lying down or in rising might cause displacement which would have a fatal result. It would be better to tie the horse up, if he can stand without support, than to put him in slings; for by bearing his weight on them, he would be apt to "roach" his back, and thus separate the broken ends. A cantharides blister rubbed over the suspected part would

aid in preventing the animal from moving it. Except in obviously fatal cases, it is difficult to distinguish between this accident and severe sprain of the "undercut" muscles (p. 61). Hæmoglobinuria (p. 520) is sometimes mistaken for broken back by inexperienced persons; although the dark-brown colour of the urine, in the former, as well as the history of the case, should readily serve to distinguish it from the latter.

Broken back generally occurs from falls, or from the practice of tying horses tightly up after casting them.

Buttock, point of the.—See "Tuberosity of the ischium," page 309.

Fig. 116.—Thigh bone (femur). (*After Chauveau.*)

Cannon Bone.

If there is displacement, the ends of the bone should, if possible, be brought into position without delay, and splints and bandages applied ("General Treatment of Fractures," p. 297).

Femur (*Thigh Bone*).

The only not very uncommon fracture of the thigh bone I need consider here, is that of the *trochanter major* (Figs. 115 and 116), which is the bony mass that projects above the head of the thigh bone (femur) and covers the hip joint. The chief muscle which extends the thigh, and thus aids in propelling the animal's body forward, is attached to the trochanter major. The only treatment is prolonged and perfect rest. The horse often recovers after this accident sufficiently well for light work. If repair does not appear to be readily taking place, the part may be blistered once or twice.

Hip, point of the.—See page 308.

Ischium, Tuberosity of the.—See page 309.

Jaw.

The lower jaw is sometimes chipped by the injudicious use of severe bits and tight curb-chains. Usually, the injury is not detected at the time of infliction. There is swelling, pain, and difficulty in feeding. The wound in the gum is generally marked by a round, red eminence. The splintered portion of bone may be felt with the probe, in which case, much time will be saved by removing it with a bone forceps. Any diseased portions of bone should be scraped off and an antiseptic (p. 67) applied several times a day. One or both branches of the lower jaw may be broken; the usual seat of the fracture being the "chin-groove" (in which the curb chain should rest, when a curb or Pelham is used). When the lower jaw has been broken right across, it will require a special form of splint, which can be obtained from a veterinary instrument maker. The general principles of treatment for fractures (p. 297) should be observed; the animal fed on soft food; and the part kept at rest.

Leg.—See "Cannon Bone," page 301; "Pastern bones," page 302; "Femur," page 301; and "Tibia," page 314.

Navicular Bone.

It is probable that this fracture occurs only in cases of navicular disease (p. 206). The symptoms are those of "dropped elbow" (p. 313), and heat of the affected part, with absence of crepitus (p. 297) about the shoulder. Treatment is of no avail.

Pastern Bones.

This accident (split-pastern) affects the long pastern bone far more frequently than the short one, and generally occurs from the violent concussion of fast galloping, which is sometimes aided by a diseased and brittle condition of the bone. Horses which are galloped, particularly on hard ground, after a long rest, are very liable to this accident, which I have seen occur on several occasions to horses in India that had broken loose after having been recently landed from a ship in which they had been imported, and in which they had been obliged to stand for a month or longer. Their enforced idleness had no doubt affected the strength of their bones, and in the unwonted exercise they had naturally lost to some extent their accustomed skill in saving their limbs from the ill effects of

concussion. The animal pulls up very lame, the toe only being brought near the ground. The absence of injury to the ligaments and tendons, and presence of swelling (after a short time) and pain about the hollow of the pastern, are often the only signs by which

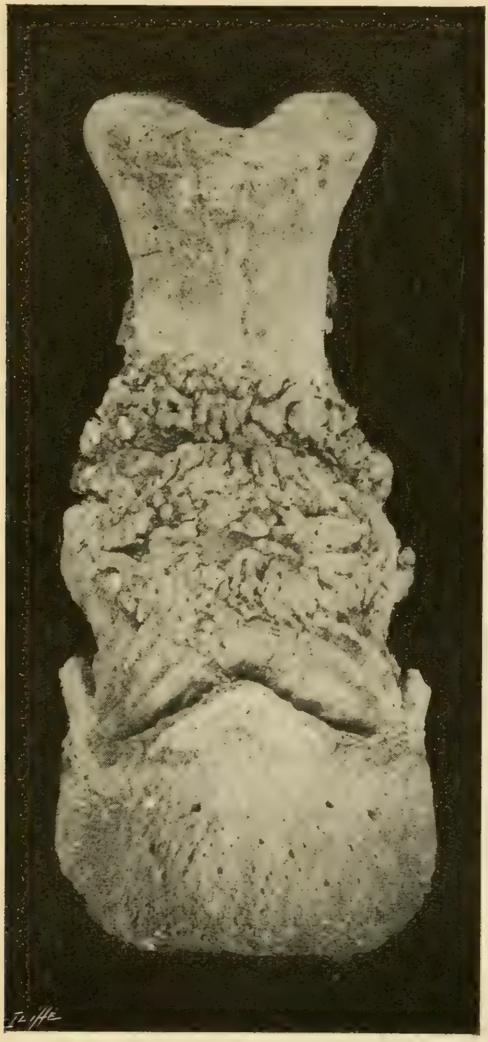


Fig. 117.—Fracture of the short pastern bone, with bony union of both the pastern and pedal joint.

we can guess the nature of the injury. Sometimes, the bone is broken into a great number of pieces, in which case, treatment will be of little or no avail. As the ligaments are strong and numerous about this part, and as the covering membrane is thick; this fracture frequently occurs without displacement, in which

case, we may expect a favourable termination. After two or three days, the broken bone, on being felt, gives, in the case of the long pastern bone, the impression that it is surrounded by a hard, thick covering (the ensheathing material), which makes it of greater circumference than the corresponding bone of the other leg. Besides, the inequalities which can be felt on the surface of the latter, at the back of the pastern, are absent on that of the former. At first, there is, above the fetlock, much sympathetic swelling, which rapidly goes down. Although, when there has been little or no displacement, the horse, as a rule, makes a good recovery for slow work; still, if used for fast paces, he will rarely regain his former speed, on account of the fracture almost always extending into one or both joints. Also, the ensheathing bony material is very apt to interfere with the action of the ligaments and tendons, especially during the extreme flexion and extension entailed on the joints by the gallop. I have known a horse regain soundness in six months after a vertical fracture of the long pastern bone which split the bone, from front to rear, into two halves, but without marked displacement. In this case I ascertained the nature of the fracture by post-mortem examination of the animal, which subsequently died from a cause (anthrax) altogether unconnected with the injury to its pastern. Fig. 117 shows fracture of the short pastern bone, with bony union of both joints.

TREATMENT.—The animal should be placed in slings in order to enable him to give the fractured limb rest and to prevent him from injuring the sound one by throwing too much weight on it. The shoe should be carefully removed, and sawdust put down, so that the horse may obtain an easy position for his foot. Although cases often do well when left alone and given complete rest, it is the safer plan to support and fix the part by careful bandaging, which may done in the following manner, as described by Peuch and Toussaint:—At first, apply a cotton bandage—about three fingers broad and four yards long—around the pastern, taking care to spread a coating of a solution of plaster of Paris over the surface of the bandage as each turn is made, so as to render it immovable. A mass of tow soaked in the plaster solution, should be placed so as to fill up the hollow behind the pastern, and should be kept in position by another bandage, over which a thick coating of plaster should also be applied. After a quarter of an hour, the plaster will become hard and will keep the part in a state of perfect rest. Care should be taken that these bandages are not put on too tightly." "Charge" composition (p. 48) may replace plaster of Paris; or we may apply a cotton wadding bandage (p. 45). A month after the accident we may stimulate the part once

or twice with biniodide of mercury ointment (1 to 8 of lard or vaseline), so as to hasten the process of union, and to cause absorption of any excess of ensheathing bony material which may have been thrown out.

There may be some difficulty in distinguishing between ring-bone and the roughness resulting from this fracture.

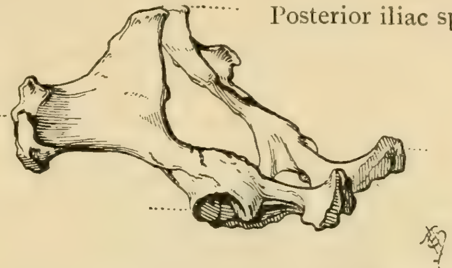


Fig. 118.—View of pelvis from near side. (*After Chauveau.*)

Pedal bone.—Cut away the wall over the part, remove all dead tissue, and treat as directed on page 297.

Pelvis.

ANATOMY.—The pelvis (Figs. 115, 118, and 119), in the hind quarters, corresponds to the two shoulder blades of the fore-hand. The two halves (one on each side) of the pelvis are united

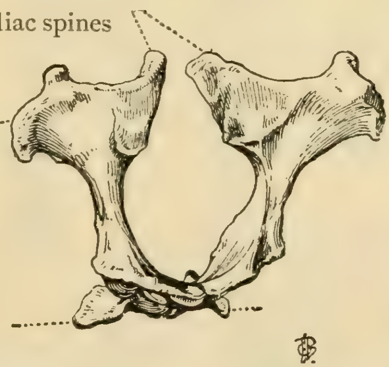


Fig. 119.—View of pelvis from below. (*After Chauveau.*)

together at their lower and posterior ends. Their upper ends (posterior iliac spines) rest on the sides of the backbone, to which they are strongly attached by ligaments, and form the highest point of the croup. The most forward portion of the pelvis at each side, is the "point of the hip" (anterior iliac spine); and the rearmost portion, "the point of the buttock" (tuberosity of the

ischium). The hip joint, on each side, is formed by the head of the thigh bone (Figs. 115 and 116) and a cavity in the pelvis ("Hip joint," Fig. 118).

VARIETIES AND GRAVITY.—Regarding the pelvis as a nearly complete though extremely irregular hoop of bone (Fig. 119), we may divide its fractures into (1) those through the body or hoop, and (2) those not extending through the body or hoop. The former, with the exception, in some cases, of fracture of the posterior iliac spine, are very serious, especially if the division of bone extends into the hip joint. The latter are much less grave; for apart from the extremely serious complication of injury to the hip joint, fracture of the body or hoop is liable to be followed by an amount of displacement that will permanently interfere with the movements of the hind limb, and, in brood mares, with the safe delivery of the foal. Here comes the question: in fracture of the pelvis, when is it worth while to preserve the life of the patient? Setting aside cases of stallions which are so valuable for breeding purposes that an attempt at saving their lives should be made at all hazards, I would answer this query by saying that the only hopeful cases are those of the point of the hip, the joint of the buttock, posterior iliac spine, and those in which little or no displacement takes place, except when the fracture extends into the hip joint.

CAUSES.—The usual causes are falls and blows. Fracture into the hip joint (fracture of the acetabulum) generally occurs, I think, from the horse falling on top of his thigh bone (trochanter major, see Figs. 115 and 116), as might happen by the animal "hitting" a fence and "turning over." In such a case, the shock would be transmitted by the head of the thigh bone to the cavity (the acetabulum) in the pelvis, with the probable result of fracture in the joint.

EXAMINATION AND SYMPTOMS.—(1) *Lameness.* As muscles which help to draw back the leg are attached to the point of the hip, posterior iliac spine, and point of the buttock, the animal, in fracture of any of these points of bone, will have difficulty in advancing the leg of the afflicted side, although he may be able to stand fairly well on it. When the hip joint is implicated, the horse will evince disinclination to bear weight on the limb of the sore side or to move it. In the large majority of cases of fracture of the pelvis, lameness will be present. Although the lameness of fracture of the pelvis has not any characteristic peculiarity, we may often observe that the sufferer walks as if his back was injured, and carries the hind leg of the suffering side stiffly to the front,

while bringing it outwards with a circular movement. (2) *Deformity and displacement.* Figs. 120 and 121 show the respective deformities seen in fracture of the point of the hip and point of the buttock. In fracture of the shaft of the ilium, the point of the hip

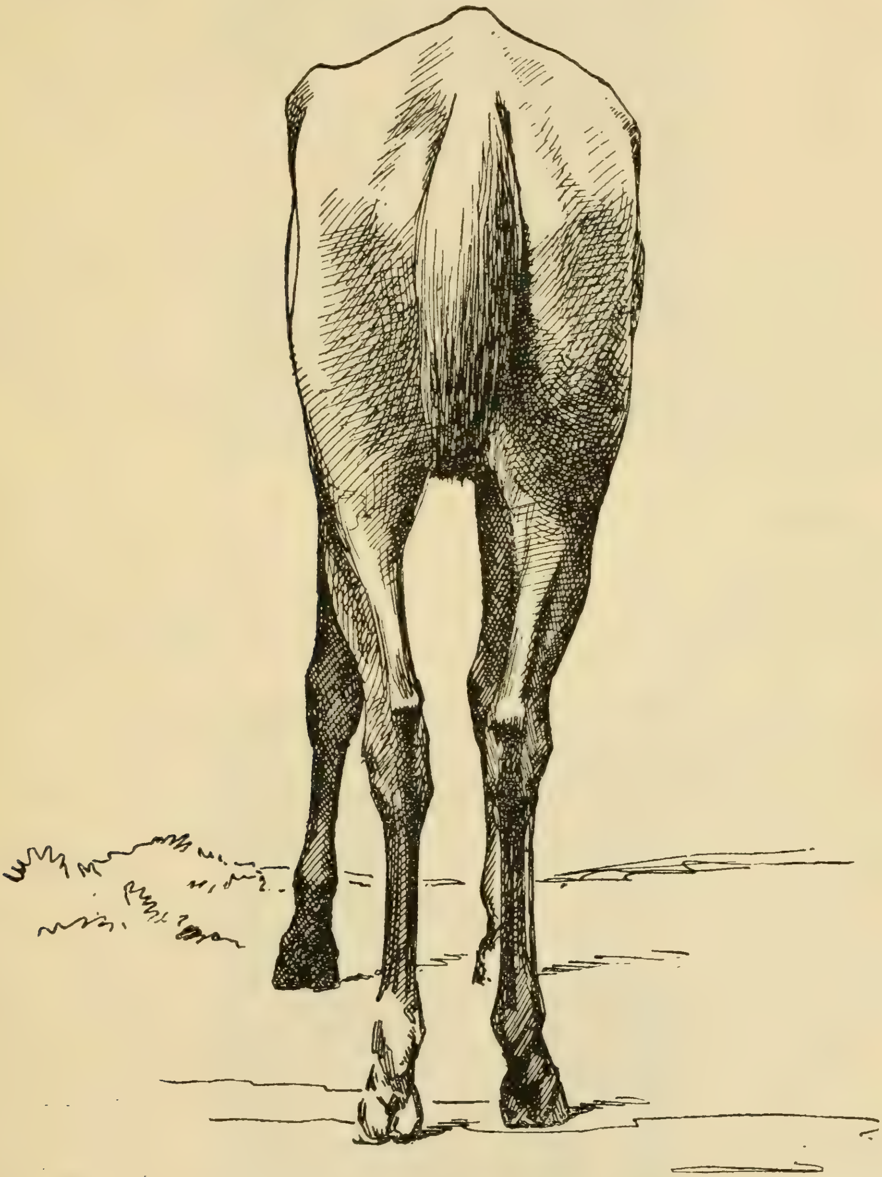


Fig. 120.—Fracture of point of the hip on off side

will more or less drop downwards, thus causing marked flatness of the quarter. I may explain that the point of the hip, unlike the posterior iliac spine, which is strongly attached to the backbone, is unprovided with any bony support upon which to rest, and con-

sequently in fracture of the shaft of the ilium, it will more or less yield to the pull of the muscles which are attached to it. With the hand in the rectum (p. 394), we can feel the displaced condition of the broken ends of the bone. (3) *Crepitation.* The sound or feeling of the broken ends of bone rubbing against each other may be perceived in cases of fracture of the body of the pelvis, when the animal is moved, or when the hand feels the parts through the bowel. (4) *Wasting.* In fractures extending into the hip joint, the muscles over the pelvis soon show marked signs of wasting, while those of the thigh take but little part in this reduction of substance.

TREATMENT.—The only possible treatment is to put the animal in slings and feed him on green food. In any of the graver forms of fracture of the pelvis, it is all but imperative to keep the animal in slings for about three months; for if he lies down, he will almost to a certainty do irreparable damage to himself by displacing the bones; consequently we shall have to accept the risk of laminitis (pp. 186 and 189).

POINT OF THE HIP (*Dropped hip*).—Fracture of this part (anterior iliac spine) (Figs. 115, 118, and 120) is, perhaps, the most common of all these injuries to the horse. It not unfrequently occurs on account of the animal hitting himself when passing through a narrow gateway, or by falls. When a gateway is at fault, the accident usually happens by two animals trying to get through at the same time. Hence, the doorway of a box or hovel which is intended for a mare and foal, should be about half as wide again as an ordinary doorway. When this fracture takes place, it is very difficult for the broken point of bone to obtain rest; because some of the abdominal muscles which are attached to it, alternately contract and become relaxed during the inspiration and expiration of air. Hence, fibrous union or a false joint (p. 297) is the usual method of repair. I have, however, seen dissections of cases in which the detached portion of bone overlapped the adjoining part of the pelvis, and became firmly fixed to it by bony union. If the disconnected portion of bone acts as a source of inflammation on account of its not becoming united, it should be cut down upon and removed. Although the accident causes an unsightly blemish, in rendering the affected side flatter than its fellow (Fig. 120), it does not, as a rule, materially diminish the animal's usefulness, and even at first, often causes little or no lameness. It is, however, from a legal point of view, an undoubted unsoundness.

TUBEROSITY OF THE ISCHIUM.—This portion of the pelvis is the rearmost bony projection ((Fig. 115) of the hind quarters,

Fig. 121.—Fracture of tuberosity of ischium on near side.

and may be called the point of the buttock. The two tuberosities, one on each side, form the channel which exists just below the root

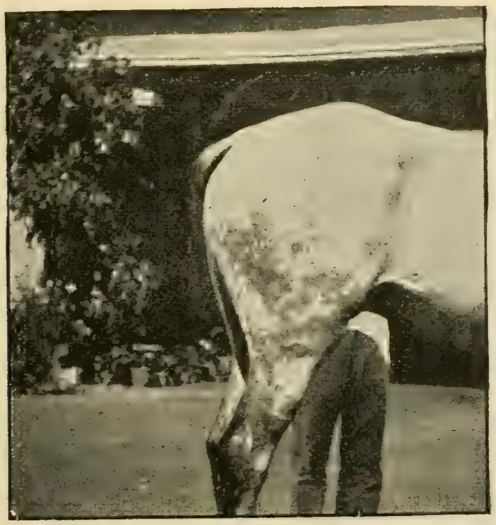


Fig. 122.—Tuberosity of ischium intact on off side.

of the tail. When this fracture occurs, the part looks unnaturally flat and straight on viewing it sideways (compare Fig. 121, which

shows fracture on the near side, with Fig. 122). The existence of pain, swelling, and lameness will also indicate the seat of injury. A good recovery may be expected, if a long rest be given. If the resulting deformity was slight, and if the injury had in no way injuriously affected the action, I would not consider this accident, after recovery, to be an unsoundness.

Ribs.

These accidents are usually caused by kicks, collisions, falls, or sudden starts into the collar by harness horses. Unless the lungs or pleuræ (the membranes which line the ribs and cover the lungs) are penetrated by the broken ends, no bad results need be anticipated. If the fractured ends have wounded the lungs, the tissue beneath the skin will soon become filled with air. This swelling can be distinguished from an effusion of serum or blood by the fact of its emitting a crackling sound when the hand is passed over it. These complicated cases can seldom be treated successfully. It is bad practice to make an external wound for examination. If a compound fracture of this nature exists, the operator should endeavour to convert it into a simple fracture by closing the wound. The external opening may be covered over with a thick coating of pitch. The practice of bandaging the chest, in cases of broken ribs, does not seem to act well with horses; although it is generally beneficial with human beings.

It is not very uncommon to see horses with an abrupt depression over one of their ribs, caused by a fracture on some previous occasion.

Pain evinced at the time of girthing up, is, sometimes, the first indication of a broken rib.

First Rib.

CAUSES.—We are indebted particularly to Mr. W. Willis, M.R.C.V.S., Mr. W. Hunting, F.R.C.V.S., and the late Mr. H. G. Rogers, F.R.C.V.S., for demonstrating by numerous *post-mortem* examinations and by investigating the history of the respective cases, that shoulder lameness is generally caused by fracture of the first rib. This accident usually occurs by the animal making a sudden start forward in harness, when there is a comparatively heavy weight behind him, and especially when he has been hanging back in the collar. Hence, impetuous, nervous, and irritable horses are most liable to get hurt in this manner. We may reasonably assume that draught horses which have to do their work at a trot, like omnibus horses, are more apt to fracture the first

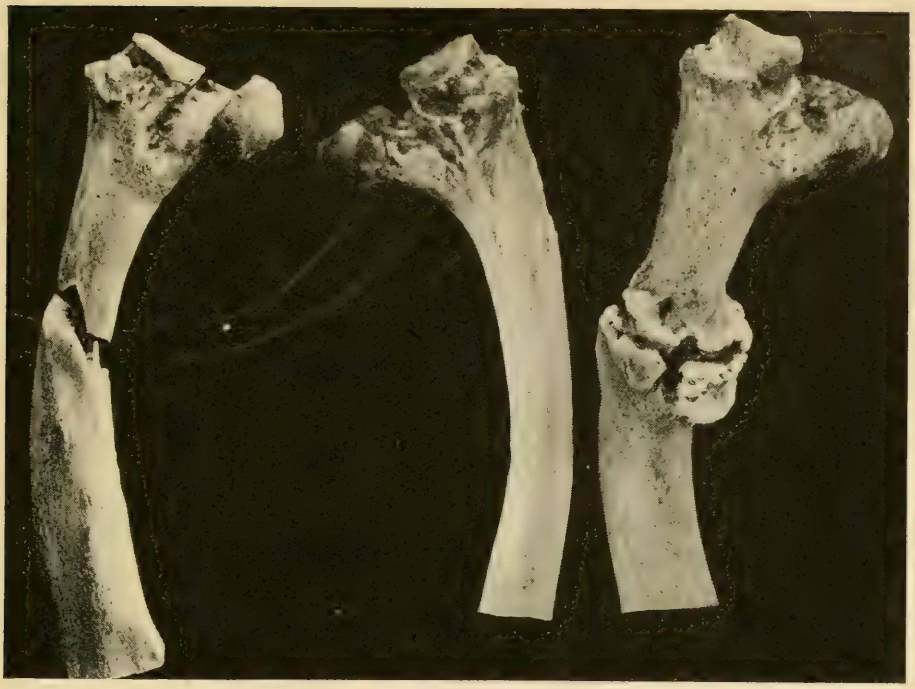


Fig. 123.
Recent fracture of
first rib.

Fig. 124.
Sound first rib, and fractured
first rib undergoing repair.

Fig. 125.
Pair of first ribs ; one sound, the
other united after fracture.

Fig. 126.
Pair of first ribs ; both united
after fracture.

rib, than cart horses which have to toil at a walk. It is evident that a forward plunge, with one shoulder more in advance than the other shoulder, would be more likely to cause this accident than if both shoulders met the collar simultaneously. A horse which has fractured the first rib on one side will, occasionally, after recovery, repeat the operation on the other side. Here, the memory of the pain does not cure the vice, but only reminds the animal that he must not practise it on the side which was injured. Figs. 123, 124, 125, and 126, which are reproductions of photographs I took from specimens very kindly lent to me by Mr. Willis, show these fractures. Increased thickness of bone due to fracture, is well marked in these illustrations.

Occasionally, saddle horses meet with this accident from falls and other injuries.

SYMPTOMS.—Sudden lameness with more or less paralysis of the limb; and "dropped elbow," in which case the elbow of the affected leg is held about six inches lower than its fellow, with the knee and fetlock bent, and the heel raised. The toe generally rests on the ground a little behind the toe of the sound leg. The lameness is characterised by inability to raise the foot, although the limb can be drawn forward to a greater or less extent; and by circumduction (outward rotation of the foot, during forward movement). This peculiarity of gait is caused by the fact that any contraction of the muscles whose office is to keep the limb close to the side of the animal (the adductor muscles), would give rise to pain by setting up movement in the broken surfaces of bone; and that the muscle (the *levator humeri*) which draws the limb forward, has very little disturbing influence on the seat of injury. This muscle is attached at one end to the humerus (the bone which lies between the elbow and the point of the shoulder), and at the other, to the top of the head. Mr. Willis ("Vet. Record," 11th May, 1901) tells us that as a rule the condition of dropped elbow lasts five or six weeks, and that the lameness gradually passes off in a few weeks longer. Owing to disuse, there is some wasting of the *flexor brachii* muscle (pp. 58 to 60), which recovers its normal state after a time.

Mr. James McKenny, M.R.C.V.S. (*Vet. Record*, 21st June, 1902), appears to be the first to point out a reliable method for distinguishing fracture of the first rib from other injuries (for instance, sprain of the flexor brachii, fracture of the scapula, fracture of the trapezium bone, and fracture of the navicular bone) which present the symptoms of "dropped elbow." He tells us that "crepitus of a fractured first rib can be obtained only by crossing the fore leg near the affected rib as far as possible across the

front of the sternum, and then jerking it outwards (adduction and abduction). The crepitus thus obtained will be readily felt when the hand during the process is kept firmly on the scapula, but at the same time the crepitus, though distinct, will be dull, and, of course, cannot be localised to any part of the scapula. It will also be absent when the leg is moved backwards and forwards."

In all cases of "dropped elbow," we should consider the possibility of sprain of the shoulder (p. 58).

The only rational TREATMENT is rest.

Shoulder Blade.

These fractures usually occur on the spine of the shoulder blade, which is the ridge that stands out at right angles to the external surface of the bone; or, at the neck, which is the narrow and rounded part just above the joint. The former accident is not very serious. If a splinter is chipped off the spine, it will have to be removed. If the neck of this bone is broken, the presence of fracture may be perceived on looking at the part just above the "point of the shoulder" (the shoulder joint), when the horse is standing; and the symptoms, more or less marked, of "dropped elbow" (p. 313) will be present. By laying the flat of the hand on the shoulder, crepitus will be felt, when the leg is brought forwards and backwards. A fracture of the neck, or body, of the shoulder blade, without displacement, will simply require a long rest in slings. If the ends are displaced, an attempt should be made to "set" them by "drawing the limb forward, and, by means of the fist, pressing back into its position the part of the bone that bulges out" (*Delwart*).

Tail.

The bones of the tail are, sometimes, broken by falls. We should endeavour to "set" them, and should support the part by padding, and apply, over the tail, a leather sheath, laced up moderately tight.

Thigh.—See "Femur," page 301.

Tibia.

This bone (Fig. 115), is, on its inner surface, so unprotected, that it is not uncommonly fractured by kicks and other injuries. Its covering membrane is, however, so thick, that when this accident

occurs, there is often no displacement; hence, horse owners should make it a rigid rule, that if one of their animals gets kicked on the inside of a hind leg, just above the hock, he should not be worked until all fear of a fracture is removed. A thickening of the bone over the seat of injury will indicate, after a few days, the existence of reparative action. The person treating the case should on no account, when making his examination, work the parts about, lest he may cause displacement. The animal should be put into slings, or "tied up," so that he may not lie down; for if fracture without displacement exists, it will almost certainly be converted into a compound one on the horse endeavouring to get up, after he has lain down. The animal should be put in slings, and an immovable bandage (p. 298) applied to the limb, from the fetlock, to as high up on the leg as it can go. Splints may be applied over this, with an adhesive bandage to keep them in position. Many cases of compound fracture of the tibia can be cured in this manner; after, of course, setting the bones in position, in the first instance.

Trapezium.

Mr. James McKenny relates a case of fracture of this bone (Fig. 8, p. 35), caused by the horse coming down with the back of its knees on stiff timber, over which it was being lunged. The animal recovered sufficiently to walk sound, but not to stand fast work. The injury is manifested by swelling, pain and crepitus of the part, and "dropped elbow" (p. 313) of that side.

CHAPTER XIV.

Dislocations.

DISLOCATION OF THE PATELLA—DISLOCATION OF THE SHOULDER JOINT—OTHER DISLOCATIONS.

A DISLOCATION is the displacement of the ends of bones which form a joint. Its chief symptoms are: deformity, decreased power of movement, and pain. If fracture exists at the same time, the power of movement in the part may be increased, with the existence, however, of alteration in the shape of the joint. The difficulties in the reduction of a dislocation arise from the contraction of the muscles—which may be overcome by the influence of chloroform—and from mechanical impediments in the part.

Dislocation of the Patella.

Although this is a rare accident, it is the most common form of dislocation which occurs in the horse.

The patella (Fig. 115) corresponds to the knee-cap in human anatomy. It is placed in front of the stifle joint, which is formed by the femur and tibia, and affords attachment and increased leverage to certain muscles, the office of which is to bring the hind leg forward. In order to keep the patella in its place, it is connected to the tibia, by three straight ligaments which antagonise the muscles in question; and there are two lateral ligaments—an internal and an external—which prevent it from slipping to one side or the other. The portion of the femur on which the patella works, is pulley-shaped, with two prominences and a groove between. As the internal prominence is larger and projects more to the front than the external one; the patella, when dislocation takes place, is almost invariably displaced to the outside.

Foals, on account of the comparative want of tenacity of their ligaments, are much more liable to this accident than are older animals, especially, if they are in a debilitated state, or are out at grass on a rough and hilly country, the nature of which would predispose them to this injury, which, however, may take place,

as a result of accident, at any age. Young horses that suffer, off and on, from this dislocation, often lose their liability to it with increasing strength and age.

The dislocation may be complete or partial. In the former instance, the patella is entirely removed from the pulley-like portion of the femur, the two prominences of which can, then, be felt with the hand under the skin. In the latter and much more common case, it rests on the edge of the pulley, only one prominence of which will be uncovered. In both, the unusual position assumed by the patella will be manifest. When the dislocation is complete, the affected limb is kept pointed to the rear, straight and stiff; while the front of the wall of the hoof, or, even, the front of the pastern, rests on the ground. The limb is carried in the same manner, if the animal is made to walk, which he naturally does with great difficulty. When the displacement is partial, the lameness is similar to that just described, although less in degree; and, if the horse is made to walk, the patella may slip into and out of its position with a certain amount of noise. Sometimes, both legs are affected, in which case, the displacement is usually partial.

When the dislocation is partial, it may become spontaneously reduced, if the animal be startled by the crack of a whip for instance, and made to move forward a few paces; or the patella may be pushed into its place with the hand, while the animal tries to advance the limb. When such simple measures do not suffice, or when the dislocation is complete, a rope should be attached to the pastern of the injured limb, passed through a collar (formed of rope, for instance) round the animal's neck, and should be drawn forcibly forward. The operator should then use every effort to push the patella into its place; while, to assist him, the animal may be backed so as to force it to put weight on the affected leg. If these methods fail, the horse should be placed under the influence of chloroform, which will cause general relaxation of the muscles. No time should be lost in reducing the dislocation; for if this be not done, injurious changes will quickly take place in the smooth surfaces of the joint in question. When the patella has been replaced into its proper position, the limb should be kept advanced by means of a side line fixed to its pastern and passed round the neck as a collar. A long-toed shoe (Fig. 104) will aid in keeping the stifle joint bent. The part may be kept at rest and repair hastened by the application of one or two smart cantharides blisters. As this accident is apt to recur, and as the involved joint becomes more and more liable to it, by repetition; we should not neglect the remedial means I have described. After the effects of the second blister have gone

off, the animal may be gradually put to work, or turned out to grass, as the case may be.

I have compiled the foregoing remarks on dislocation of the patella chiefly from Peuch and Toussaint's "Chirurgie Vétérinaire."

Dislocation of the Shoulder Joint.

This injury is of extremely rare occurrence, although a good deal has been written about it.

ANATOMY OF THE PARTS.—This is a ball-and-socket joint, formed by the rounded head of the humerus and the shallow cavity which is on the lower end of the shoulder blade (Scapula, Fig. 115). It possesses only one ligament, the capsular ligament, which envelops it like a bag, open at both ends, one end of which is attached round the cavity in the end of the shoulder blade: while the other is fixed round the head of the humerus. This capsular ligament loosely envelops the joint and allows the two articulating surfaces the power of separating from each other to the extent of nearly an inch. The stability of the joint is maintained by the muscles of the part, which more or less serve the purpose of ligaments to it, and also by the pressure of the atmosphere.

DEFINITION.—The joint (Fig. 31, p. 59) here involved is usually termed "the point of the shoulder," and is composed of the lower end of the shoulder blade and the head of the humerus, the latter, according to Möller, being always found in this accident above, and to the front of the former. The head of the humerus will also be usually displaced to the outside of the end of the shoulder blade.

CAUSE.—Taking into consideration the position of the bones after this dislocation and the fact that the more the elbow joint is bent and the shoulder joint straightened, the more easily can the head of the humerus be displaced in a forward direction; we may conclude that the most likely position of the limb for this accident to occur in, is when the fore arm is stretched forward. Hence, if a horse falls, for instance, in jumping or from "slipping up," and comes down on the ground with his fore arm stretched out to the front, with or without the leg below the knee being doubled under it; the shock, being transmitted more or less vertically upwards through the humerus, would naturally tend to force the head of that bone out of the cavity (at the lower end of the shoulder blade) in which it normally rests, and in a direction in front of and above it. The flexor brachii (Fig. 31) acts in preserving the stability of the shoulder joint by exerting a downward and backward pressure on the head of the humerus.

SYMPTOMS.—There will be marked deformity of the point of the shoulder, as may be seen if it be compared with the other

side. Although the masses of muscle about the part make it difficult to determine the exact way in which the dislocation has occurred; we may, if the head of the humerus has been carried to the front, feel it as a rounded protuberance with a depression behind it; which symptom would be reversed, if the head of the humerus be behind the shoulder blade. The dislocated limb will be incapable of almost any movement, and only the toe will touch the ground. When the head of the humerus is pushed forward and outwards, the elbow will be turned in, and the toe pointed out.

As Rigot and others have observed, this dislocation is frequently complicated by fracture of the head of the humerus, or by a

Fig. 127.—Clove hitch.

fracture, at the end of the shoulder blade, passing through the cavity which serves as the shallow socket in which the head of the humerus moves. We can distinguish, as pointed out by Peuch and Toussaint, the fact of fracture of the head of the humerus having occurred, with or without dislocation, by observing that the part has got shorter and that its mobility has increased, and by noting the grating together of the ends of the fractured bone. In dislocation without fracture, there is always unusual stiffness of the limb.

CHANCES OF RECOVERY.—If a dislocation of the shoulder, uncomplicated by fracture, be undertaken early, and is properly treated, the animal ought, in the majority of cases, to make a

good recovery, and be fit for any ordinary work in a month or two. Colonel Nunn ("The Veterinary Journal," May, 1890) treated for this accident a mule, which returned to work after having been on the sick list only twenty-five days. The chances of a recovery without lameness after a dislocation with fracture (unless there was no displacement) would be remote.

TREATMENT.—The horse should be thrown on his sound side, every precaution being taken that he does not get hurt. With this object, we may adopt the method described on p. 646, taking care to pull the head round to the injured side. The "falling" should be made as soft as possible. It is almost essential to employ an anæsthetic, such as chloroform or ether; for without it the operator will have but little chance, if the horse be strong, of overcoming the resistance of the muscles of the part. Here, complete muscular relaxation, and not merely insensibility, should be the object in view. Nunn remarks about his case, that "this mule was a miserable, weak animal or I would never have been able to operate without chloroform." A rope should be attached to the pastern of the injured limb, which should be pulled backward so as to straighten it; or this might be done by means of a long piece of soft cloth attached to the fore-arm by a clove hitch (Fig. 127). One man in front of the chest should press with his hands the head of the humerus backwards (if the dislocation be of the usual kind); while another kneeling behind the withers (as recommended by Major Blenkinsop), places the palm of his hand at the back of the shoulder blade, as near the shoulder joint as possible. Similar arrangements may be made to suit the kind of dislocation, if it be of a different nature. The reduction of the dislocation will be accompanied by a dull click. If this be not heard, the altered and natural appearance of the limb will be a sufficient guide to show that the operation has been successful. After the animal has got up, he should be put into slings, and a blister rubbed over the seat of injury. Of course, the slings should be fixed no higher than just enough to allow the patient to rest on them if he likes. The animal should be kept on laxative food. When he is seen to bear his weight on the leg, he may be very gradually brought on to exercise it. In this, and in determining the period during which the patient is to be kept in slings, the person in charge will have to exercise his own judgment. In favourable cases, the horse will be able to walk in about a week or ten days.

I have been told that swimming the horse, immediately after the accident, is a common method of treatment for dislocation of the shoulder and other injuries in Australia and New Zealand.

In such a case, the animal should be led from a boat or canoe, and not ridden.

Other Dislocations.

There are certain other forms of dislocation met with in the horse; but as they seldom admit of successful treatment, I need not discuss them here.

CHAPTER XV.

SYNOVIAL ENLARGEMENTS.

GENERAL REMARKS—WINDGALLS OF THE FETLOCK—BOG SPAVIN—WINDGALL BELOW THE HOCK—THOROUGHPIN—WINDGALL OF THE KNEE—CAPPED KNEE—CAPPED WITHERS—SYNOVIAL CAPPED HOCK.

General Remarks.

ANATOMY.—In order to diminish friction between certain structures, closed membranous sacs, containing an oily fluid called *synovia* (joint oil), are placed between them. From injury, and sometimes, apparently from mere weakness, there may ensue an effusion of serum into one or more of these sacs. Thus we have in bog spavin an enlargement of the synovial membrane which lines the capsular ligament of the true hock joint; in capped knee, we find distension of the synovial bursæ which facilitate the movement of the extensor tendon over the front of the knee; and in thoroughpin, there is distension of the synovial sheath which allows the perforans tendon to glide smoothly over the os calcis (Figs. 98 and 130). These instances afford us examples of the three actions respectively performed by the three classes of synovial membranes, viz.: to line the capsular ligaments of joints; to allow one surface to glide over another; and to line a canal or sheath through which a tendon passes. If the effusion takes place into the joint, thereby causing distension of the capsular ligament, we have "dropsy of the joint." When one of the other kinds of synovial sacs becomes thus affected, the condition is termed "dropsy of the bursa."

With the exception of capped knee, which is the result of injuries, these enlargements are, as a rule, signs of work in old horses, and of weakness in young ones. In the great majority of cases, the superabundant fluid remains unchanged, and the animal suffers little or no inconvenience from its accumulation. Heat and hardness are the two chief signs by which we may recognise the fact that an enlargement of this kind interferes with the soundness of the animal. As long as it remains cool and soft, its existence will, as a rule, be of but little detriment. The hardness, owing to the enlargement becoming converted into fibrous tissue or bone, may remain after all heat has disappeared, in which case, the presence of the deposit may interfere with the action of joint, tendon, or ligament. Although synovial enlarge-

ments may be symptoms of grave injury, such as that of sprain of neighbouring parts; their presence, when uncomplicated by other affections, rarely diminishes the usefulness of an animal; and consequently, they should not, as a rule, be interfered with.

GENERAL TREATMENT.—The best thing to do, if practicable, is to employ massage (p. 664), and apply pressure by means of cotton wadding (p. 45), or other soft material. If we cannot do this, and if heat and inflammation be present, we should use warm fomentations; put the horse on laxative food; and give a purgative if necessary. When applicable, we should employ a high-heeled shoe (Fig. 4, p. 27), in order to throw the part into a state of rest. Trusses made for the reduction of bog spavins and thoroughpins may be used. As a rule they are difficult to adjust properly. The continued application of tincture or liniment of iodine, rubbed in twice a day, has been found to be of service in some cases. Blisters and rest may cause absorption for the time being; but the distension will generally reappear as bad as ever on the resumption of work.

When there is no inflammation or abnormal heat in the part, the excess of synovia may be safely drawn off by means of an aspirator; provided that strict antiseptic precautions (p. 70) are observed. The operation, to be successful, must be performed with skill and great care. As it is attended with risk, and as it offers little or no practical benefit, it is not often wise to attempt it, especially with bog spavin, in which case the failure of the antiseptic precautions would be followed by open joint, and as a result of that, by a permanently stiff hock joint, if not by death.

Windgalls of the Fetlock

may be said to be a distended condition of the synovial bursæ of the fetlock. They appear at first in the form of soft, "puffy" swellings, which may vary, in magnitude, from the size of a pea, to that of a hen's egg, or even larger. From the presence of inflammation, they may become hard from becoming converted into fibrous tissue or bone.

ANATOMY.—The usual positions they occupy are as follows:—1. In the space between the branches of the suspensory ligament and the perforans tendon: this is their usual site. 2. "In the interval between the perforatus and perforans tendons, about two inches above the sesamoid bones; indeed, the sac of the windgall, from surrounding attachments to its borders, appears as though it gave passage to the perforans tendon through its cavity; though this appearance, in point of fact, is owing to the membrane of the bursa being reflected upon the surface of the tendon" (*Percivall*). 3. In front of the fetlock under the tendon which extends the foot. The enlargement is then

a distended condition of the capsular ligament of the fetlock joint. 4. As mentioned by Percivall, in front of the fetlock, but between the extensor tendon and the skin. 5. Between the sesamoid bones and the perforans tendon. In this last form, as the distended sac cannot, owing to the pressure of the perforans tendon, bulge backwards; it appears as a puffy swelling at both sides of the back of the fetlock, constituting what we may term thorough-pin of the fetlock.

TREATMENT.—Although windgalls, when they are soft and cool, are of little consequence; still, for appearance sake and to prevent their further development, we may with advantage try massage (p. 664) and bandaging with evenly distributed pressure (p. 45), which have a marvellously good effect in reducing them.

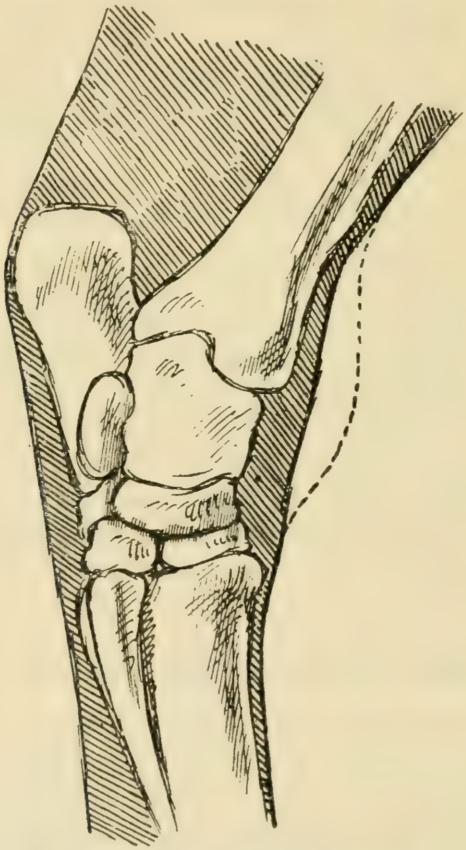


Fig. 128.—Position of bog spavin, indicated by dotted line.

If this treatment be discontinued, the probability is that the windgalls will again show as soon as work is recommenced.

When the appearance of a windgall is accompanied by heat, and especially when there is tenderness and lameness; we may regard the enlargement as a symptom of sprain to tendon or ligament, or of inflammation of bone from concussion. Here, also, massage

and bandaging with cotton wadding will be the best treatment at first. The affection (splints or sprain for instance) which gives rise to the windgall, should be specially treated.

Bog Spavin

appears as a soft swelling to the front and to the inner side of the hock joint. Its position, which is indicated by a dotted line in Fig. 128, is higher up than the seat of bone spavin. A com-

Fig. 129.—Front view of near hock.

Fig. 130.—Rear view of near hock.

parison between Figs. 131 and 132 shows the exact spot at which we should look for bog spavin.

ANATOMY.—This ailment is a distended condition of the synovial membrane of the capsular ligament of the true hock joint—that which is formed by the tibia and astragalus (Fig. 98)—and lies between the base of the astragalus and the internal lateral prominence (the malleolus) of the tibia. "It shows itself at the inner side of the joint, because here the ligaments are wider apart, and there is more room for distension" (*Stonehenge*). It is soft and elastic, and extends up and down the inner front of the joint for about four inches, or more, as the case may be.

Bog spavins often exist without any symptom of inflammation. In other cases, the distension is, at first, hard, painful to the

touch, and accompanied with more or less lameness, indicating sprain, or other injury of underlying structures. In the former instance, the affection seldom impairs the usefulness of the animal and is generally the effect of premature overwork, or of a defective shape of the joints, which is frequently due to hereditary predisposition; and the swelling is soft, fluctuating, and cool. In the latter, the injury is always serious, and demands complete rest. I would not regard a bog spavin in an aged horse as an unsoundness, if it was free from any inflammatory symptom, was of moderate size, and was unaccompanied by lameness.

Thoroughpins usually accompany large bog spavins, because the distended capsular ligament of the latter tends to push up the bursa of the perforans tendon out of its place.

See "General Treatment," p. 323, and remarks on drawing off the fluid.

Windgall below the Hock.

I am entirely at a loss to give an apt and popular name to this condition (Figs. 133 and 134), which is, anatomically speaking, dropsy of the bursa of the peroneus tendon. It is a very rare affection among English, Colonial, and Eastern horses; although it is not, I believe, unfrequent among Continental horses that have undergone a "school" training, in which excessive "collection" is demanded. It does not appear to diminish the usefulness of the animal. In a case of a steeplechase horse which I was training, and which had a windgall of this kind on each hind leg, these enlargements gradually disappeared after I had the animal in work for about a month.

Thoroughpin

appears as a swelling at the back of the hind leg, just above the point of the hock, and in front of the tendons (the hamstring) which are attached to that part (Figs. 135 and 136). When pressed with the finger at one side of the limb, it will bulge out with increased prominence on the other side; hence the name.

ANATOMY.—It is a distended condition of the synovial sheath which surrounds the perforans tendon as it passes over the os calcis (Fig. 98). The sac thus formed is pushed up into the space between the perforans tendon and the tendo Achillis, which is the name given to the tendons that pass down to the point of the hock.

As in bog spavin, many horses are predisposed to thoroughpin by defective shape, which, as a rule, is inherited.

Fig. 131.—Clean hock.

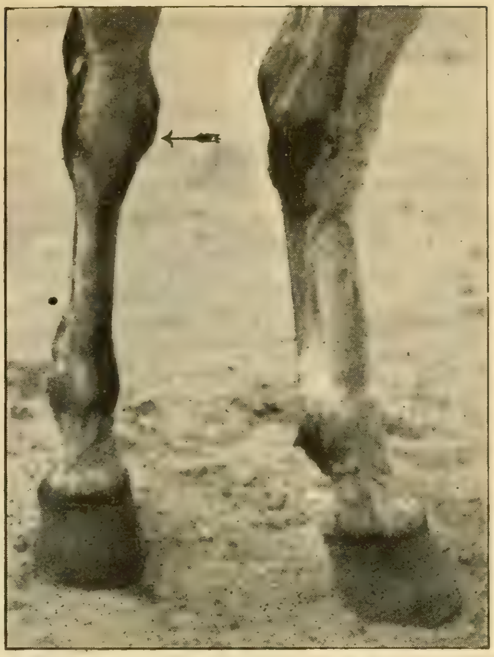


Fig. 132.—Bog spavin.

Fig. 133.—Front view of windgall below hock.

Fig. 134.—Side view of windgall below hock.

Thoroughpin, like bog spavin, is often unaccompanied by inflammatory symptoms, and is then of little moment. When, how-

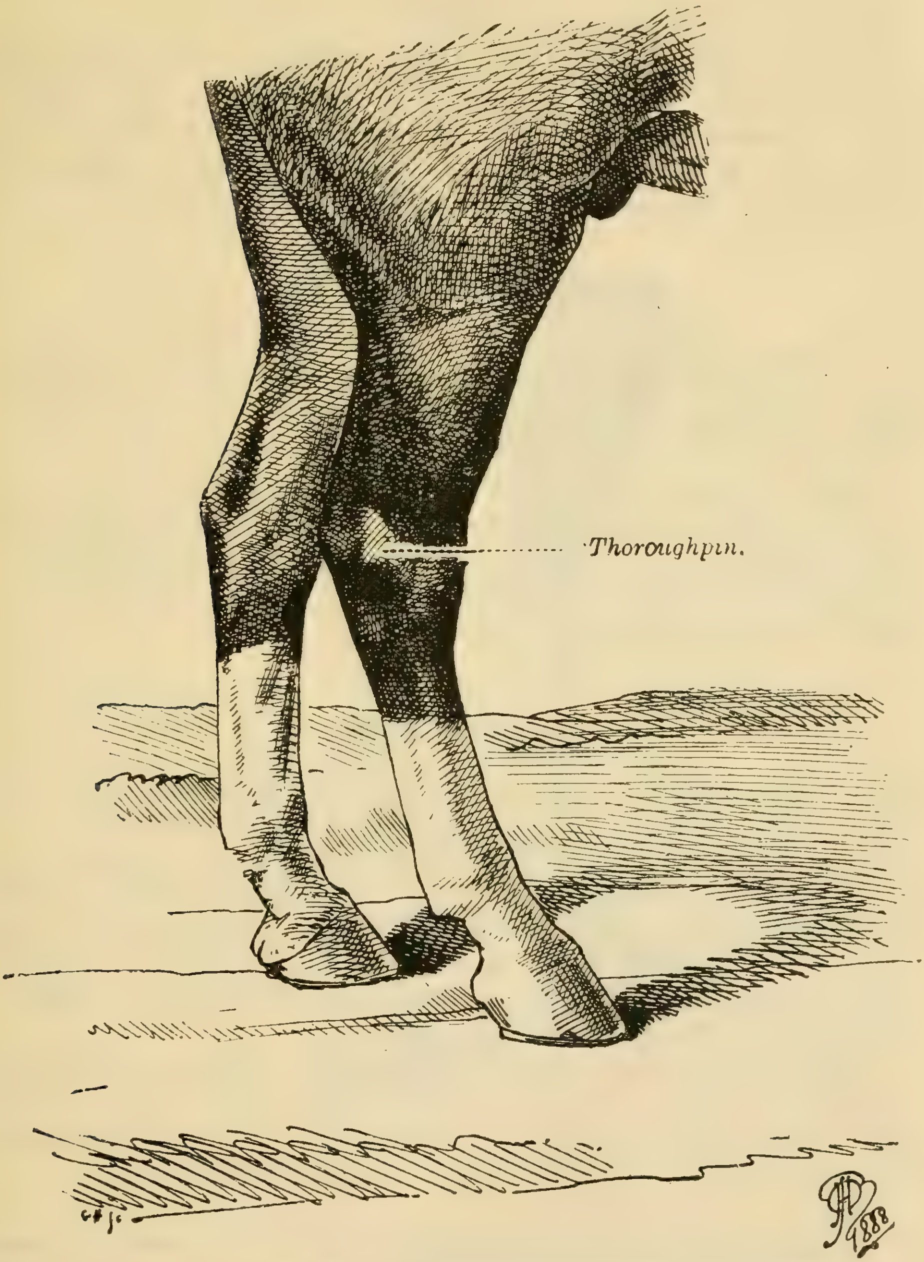


Fig. 135.—Side view of thoroughpin.

ever, it is due to sprain of the back tendons, it is a very serious affection. Heavy cart stallions not uncommonly get these enlargements from the strain on their hocks consequent on cover-

ing mares. Thoroughpins are frequently seen, as a result of work, among hunters which have gone through a few hard seasons. In such cases, when small and when unattended with lameness or local heat, they are not an unsoundness.

See "General Treatment," p. 323.

Mr. J. S. Barber, M.R.C.V.S., tells me that he has always had excellent results in the treatment of thoroughpin, by rubbing oleate of mercury of a ten per cent. strength on the enlargement with a stiff brush once a day for three days, and, if necessary, repeating the application after an interval of a week.

Windgall of the Knee.

I venture to apply this arbitrary term to a synovial enlargement which sometimes appears on the outer side, and on the upper part of the knee, and which consists of dropsy of the bursa of the tendon of the flexor pedis perforans, which is the front one of the two back tendons (Fig. 6, p. 31). In some cases, it attains the size of a man's fist. I have never seen it among saddle-horses; but have occasionally met with it among cart-horses, the usefulness of which it did not seem to injuriously affect to any marked extent.

See "General Treatment," p. 323.

Capped Knee

is a dropsical condition of one or both of the synovial bursæ of the tendon (*extensor metacarpi magnus*) which passes over the front of the knee. It is usually caused by blows. It may also occur, especially when hunting or steeplechasing, from a thorn (p. 99) puncturing the tendon which plays over the bag containing the joint oil in front of the knee. When this accident happens, inflammation is set up in the tendon, with the result of an effusion of serum into the bursæ.

Capped knee is of very little consequence when it is simply a distended condition of the synovial bursæ; but if the tendon be also affected, it is a serious complaint, and will be accompanied with more or less lameness.

TREATMENT.—If the case does not yield to the effects of rest, massage (p. 664), and pressure (p. 45), we may rub into the part, with a certain amount of friction, liniment of iodine two or three times a day. If the swelling still continues, we should stimulate it with biniodide of mercury (1 to 8 of lard). The synovia in the distended bursa may, then, become absorbed on undergoing a further

change. If, after a blister or two, the swelling still remains soft, we may draw off the fluid at its lowest point by means of an aspi-

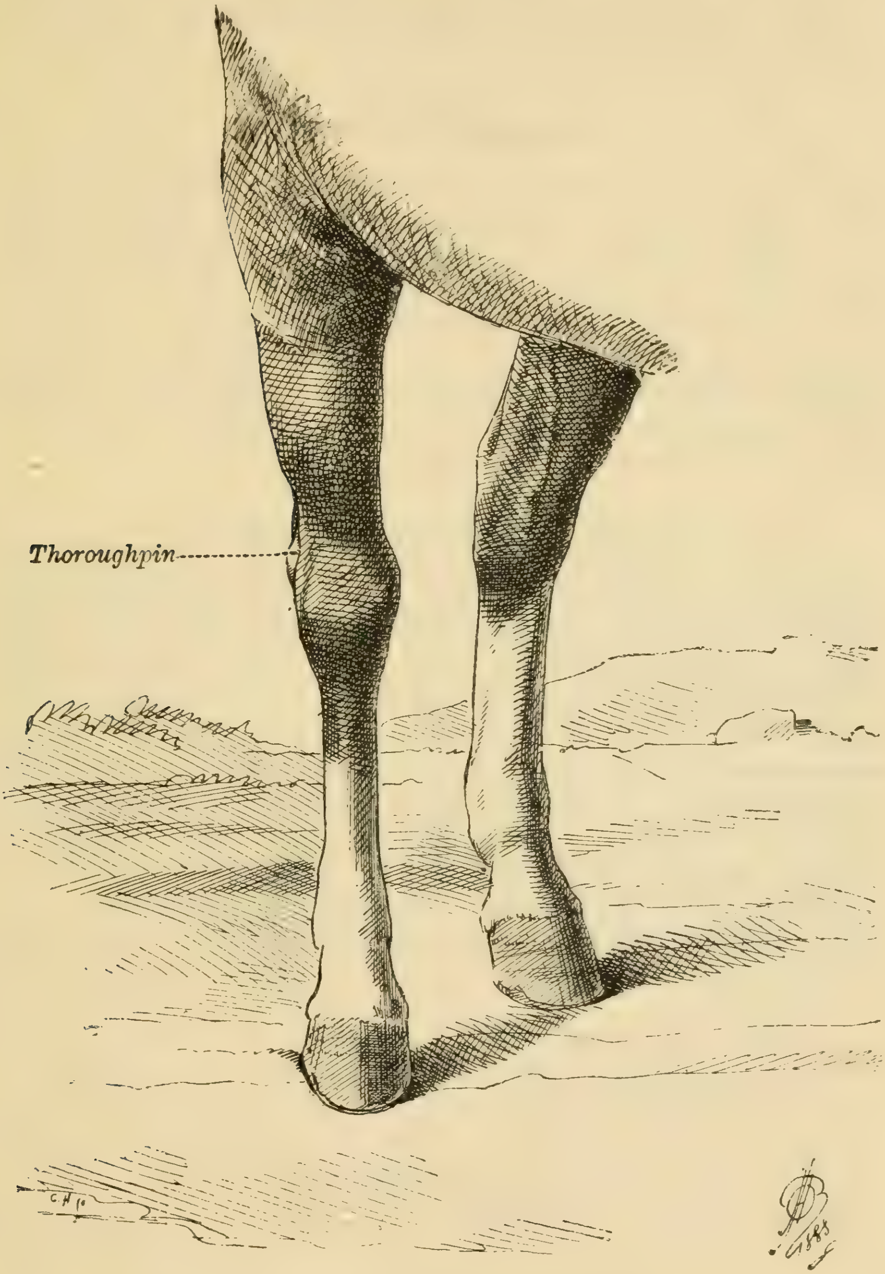


Fig. 136.—Front view of thoroughpin.

rator, under antiseptic precautions (p. 70) and bandage. Or, as is usually done, we may make a small horizontal incision at the lowest point of the sac, which we may syringe out well with an

antiseptic solution (p. 67), dress the wound with tannoform or iodoform, cover it with two or three thicknesses of antiseptic wool, and then apply a firm cotton wadding bandage (p. 45) over the part. The object of the bandage is to cause the walls of the sac to unite together.

Capped Withers

is an enlarged condition, as a result of inflammation from injury, of the synovial bursa which lies on the top of the withers. It may be distinguished from an abscess by its being soft and movable, without any tendency to "pit" on pressure, and without its being surrounded by a hard zone of inflamed tissue. It feels less hot to the touch than a recent abscess near the withers, and pursues a much slower course. We should apply to it the same treatment as that for capped knee (see preceding paragraph); allowing for difference of position.

Synovial Capped Hock.

This form of capped hock is due to enlargement of the synovial bursa which is placed between the point of the hock and the tendon that is attached to that bone. "It appears as a tense fluctuating swelling, situated on both sides of the point of the hock" (*Williams*). The rigidity of the tendon prevents the swelling projecting backwards. This not very common affection is, undoubtedly, an unsoundness. It may be caused by sprain of the tendon, or by blows. Treatment consists in giving rest, using massage (p. 664), and applying a high-heeled shoe. Blistering or firing may be tried in cases which do not yield to milder measures.

For the more common, though less serious form of capped hock, see next chapter.

CHAPTER XVI.

Serous Cysts.

GENERAL REMARKS—CAPPED HOCK—CAPPED ELBOW—SEROUS CYST NEAR THE WITHERS.

General Remarks.

A serous cyst is a cavity formed by an effusion of serous fluid into connective tissue, the fibres of which, by the consequent pressure, " are squeezed together and thus form the membranous wall of the cyst, which subsequently becomes thickened by new growth of fibrous tissue" (*Erichsen*). A cyst of this kind may be defined " as a cavity resulting from the abnormal distension of a natural space, surrounded by a more or less distinct wall, and filled with fluid or semi-solid matter" (*Erichsen*). These enlargements are specially liable to occur as a result of inflammation, immediately underneath those portions of the skin which cover bony prominences; because, in these positions, the extent of the seat of injury being narrowly limited between the bone and the skin, a closely confined effusion is more likely to take place, than in a part surrounded by soft structures.

Serous fluid (p. 13), which is the watery fluid we find on opening a blister, often accumulates at the point of the hock, or at the back of the elbow, causing these parts to become " capped," as a result of injury. Unlike synovia, serous fluid generally becomes quickly organised into fibrous tissue.

These enlargements, though unsightly, rarely cause uneasiness to the horse. They may be treated boldly by surgical means, as they are well removed from any important structures. If the case be of long standing and the seat of injury be on the surface of the body, the distended condition of the skin which covers the part, will persist after the subsidence or removal of the enlargement.

Capped Hock.

Ordinary capped hock is a serous cyst situated at the point of the hock (Fig. 137), between the cap of the perforatus tendon and the skin (Fig. 28). It is usually the result of blows, which are

generally self-inflicted in the stable. I believe that the presence of mice or rats in a box or stall is a frequent cause of horses kicking at night, and thereby injuring their hocks. I have frequently stopped horses kicking at night, by keeping a cat or two along with the animal by night. Although the presence of this injury detracts from an animal's value, especially, as it may indicate vice; it rarely affects the horse's usefulness, except when the part is in an inflamed condition.

TREATMENT.—When the injury is recent, gentle massage (p. 664) and warm fomentations should be applied. If an attempt is to be made to reduce the tumour—which should not be done until all heat and inflammation have subsided—a seton, which should not be allowed to remain longer in than ten days or a fortnight, may be passed through its centre; or the part may be stimulated, from time to time, with biniodide of mercury (1 to 16 of lard). As the enlargement is not connected with any important structure, it may, after it has become hard and free from all heat, be removed by the knife under antiseptic precautions (p. 70). A favourite application among stable men for the reduction of a capped hock, is a paste made with fuller's earth or size mixed with vinegar, and kept plastered over the part while the horse is in the stable. It is brushed off before he is taken out to work.

Capped Elbow.

NATURE AND CAUSES.—Capped elbow is a serous cyst situated behind the elbow joint (Fig. 138), and is almost always caused by the part having been hurt by the heels of the shoe pressing upon it, or striking it. This injury is usually inflicted by pressure when the horse is lying down, in which case, hardness of the floor, deficiency of bedding, and securing the animal in his stall with too short a tying-up rope (or chain) will be predisposing causes. When a soft substance (bedding) is interposed between two opposing surfaces (the floor and the hoof), the severity of the resulting pressure or shock (on the elbow) will be decreased by its more extended and more gradual distribution. Tying up the horse short acts by inducing him to lie on his breast-bone, with the heels of his fore feet close to his elbows, instead of lying on his side, which is his natural recumbent position. Among Russian match trotters it is often due to the heel striking the point of the elbow during fast movement. Miners sometimes suffer from a similar enlargement ("miner's elbow").

As a rule, it causes lameness, only when it is in an acutely painful state, and when its size interferes with movement.

TREATMENT.—We can generally arrest its development if we treat it properly in its earliest stage. With this object in view, we should provide against the predisposing causes, by giving the animal a soft bed to lie on, and let him have full length of tying-up rope, if he is in a stall. We should remove the shoe,

Fig. 137.—Capped hock.

or get the horse shod with short shoes, and at night cover the heel with some soft material, such as felt, so that the shoe may not hurt the elbow; or tie him up. Or we may apply a kind of pillow round his fore arm, or round his pastern; so that, when he

lies down, his heel will not be able to touch his elbow. The Offord and other elbow pads are effective appliances for accomplishing this object. In Russia, an arrangement similar to the Offord pad is used with those match trotters which are liable to hit their elbows. It is well to use gentle massage (p. 664) and continued fomentations of warm water for a few days, and after that rub in for a considerable time every day, during a fortnight or so, the following liniment:—

Soap liniment	$\frac{1}{4}$ pint.
Strong liquid ammonia	$\frac{1}{2}$ drachm.

The pressure caused by the rubbing and the stimulating effect of the liniment will generally make the tumour disappear. If the enlargement does not yield to these simple means, we may pass a seton through its centre in a vertical direction. We may with advantage adopt the advice of Schrader (Möller's "Veterinary Surgery"), who directs that a rubber tube, about the thickness of a quill, should, without cutting the skin, be passed round the base of the tumour, drawn tightly and the ends tied together with string. If the base of the tumour be not well defined, we may use a preliminary ligature of thin whip cord until the tumour in front of it has swollen sufficiently for the rubber tube to retain its hold; or we may transfix the tumour with a suitable skewer. The ligature should be tightened from time to time as may be necessary. The circle of constriction should be kept free from infection by the use of a suitable antiseptic (p. 67). The tumour will fall off in about a week. Its removal, owing to the presence in it of large blood-vessels, should not be hastened by the knife; although gentle torsion may be employed. The subsequent wound may be treated by, for instance, the plentiful use of iodoform or tannoform, or by a solution of chloride of zinc, 20 grains to the ounce of water. If the tumour is already hard and fibrous, we can safely remove it with the knife, or écraseur (Fig. 113, p. 289). To do this, we should make a long vertical incision, preferably with the hot iron, through the skin, and then carefully dissect the tumour out with the knife, or pass the chain of the écraseur over it, and screw up the instrument until the base of the tumour is cut through. It is advisable to apply a strong caustic (such as 40 grains of chloride of zinc to the ounce of water) or a red-hot firing iron to the wounded surface left by removal of the tumour, so that the serous membrane may not continue to secrete serous fluid and thus leave a running sore. Afterwards, tannoform, iodoform, or a saturated solution of iodoform in turpentine or in eucalyptus oil may be freely applied to the part.

Serous Cyst near the Withers.

Sometimes pressure by one of the points of the tree of the saddle against the upper end of the shoulder blade, causes a serous cyst to form about four inches below the top of the withers and on one

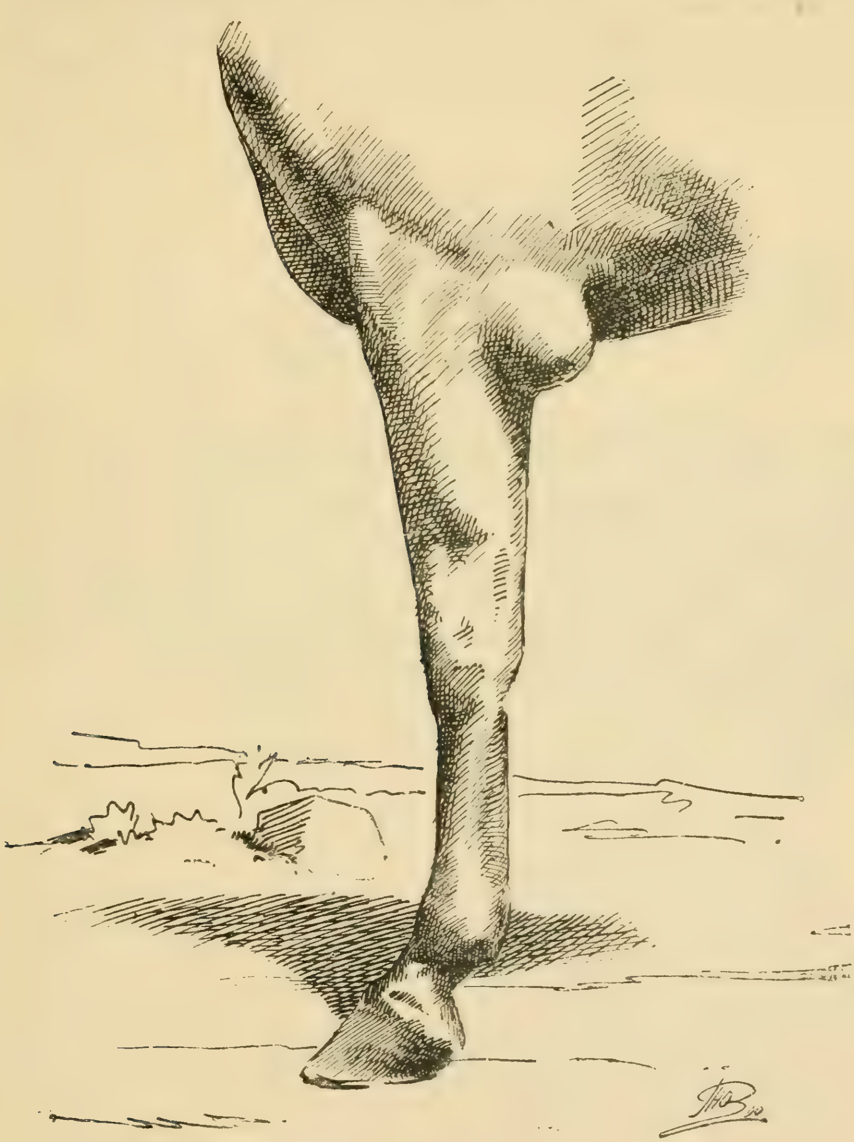


Fig. 138.—Capped elbow.

side of the withers. We may distinguish it from a collection of pus, by the fact that although it is fluctuating to the touch, it is much deeper seated than an abscess which not unfrequently forms near

the same spot, as a result of pressure against the side of the withers, especially on the off-side from a side-saddle (p. 101).

TREATMENT.—The best method of treating this affection is to draw off the serum with an aspirator under antiseptic precautions (p. 70), which is an operation that requires surgical knowledge and skill. If we cannot do this, we may make an opening through the skin at the lowest point of the tumour with a rowelling scissors (Fig. 139), and give exit to the fluid with a probe. We should then

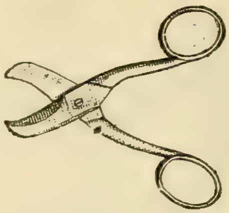


Fig. 139.—Rowelling scissors.

syringe into the cavity an antiseptic solution (p. 67), and having again emptied it, we may repeat the operation. After having withdrawn the syringe, we should cover over the wound with tannoform or iodoform and antiseptic cotton wool. The syringe and probe, before being used, should be placed for about five minutes in boiling water, and after that, in a solution of creolin or carbolic acid (1 to 20 of water), so as to render these instruments free from organisms which might give rise to suppuration.

CHAPTER XVII.

DISEASES OF THE EYES.

SKETCH OF THE ANATOMY OF THE EYE—SIMPLE OPHTHALMIA—PERIODIC OPHTHALMIA, OR MOON BLINDNESS—CATARACT—TURNING IN OF THE EYELASHES—WORM IN THE EYE—WORMS UNDER THE EYELIDS—AMAUROSIS, OR GLASS EYE.

Sketch of the Anatomy of the Eye.

THE surface of the eye (Fig. 140), and the inside of the eyelids is covered by the *conjunctiva*, which is a delicate mucous membrane. The front of the eyeball consists of a strong transparent structure, the *cornea*, which is somewhat of the form of a small watch-glass; and the remainder of the part consists of a strong fibrous coat, the *sclerotica*, which is lined by a dark membrane, the *choroid*. Behind the cornea, and attached to the choroid, hangs a thin contractile curtain, termed the *iris*, through the centre of which there is an elliptical opening known as the *pupil of the eye*. The anterior portion of the sclerotica lies immediately under the so-called *white of the eye*, which is the expansion of the tendons of muscles that move the eye. We may regard the cornea as the continuation of the sclerotica; and the iris, as that of the choroid.

The pupil is dilated by means of radiating muscular fibres which are in the iris; and is closed by circular fibres placed round the margin of the opening. The distinctive colour of the eye is derived from that of the iris, which "is variously coloured, but in the horse is brown, with more or less of a yellow tinge; sometimes, however, it is almost white or grey, when the animal is said to be 'wall-eyed'" (*Strangeways*). Behind the iris, which is slightly convex, and suspended from the choroid, is a biconvex, transparent, solid body —the *crystalline lens*—which is compared by Chauveau to a rose diamond. The lens divides the eye into two compartments; the anterior, which is partially divided by the iris, and filled by a watery fluid called the *aqueous humour*; and the posterior which holds a very similar, but denser, liquid—the *vitreous humour*. The crystalline lens is covered by a transparent membrane called the *capsule*.

The *optic nerve*, proceeding from the brain, enters the eyeball at its posterior part, and pierces the sclerotica and choroid, and by its expansion, forms a membrane, the *retina*, which lines the choroid, and terminates at the circumference of the crystalline lens. When rays of light, coming from any object, fall on the eye, they enter the pupil, and passing through the crystalline lens, form an image on the retina, which conveys, through the optic nerve to the brain, an impression of the object seen. This optical apparatus differs from

an ordinary photographic camera by, among other things, the "stop" (the pupil) being in front of the lens, and by the focussing being performed by alteration being made in the shape of the lens by the action of certain muscles. The choroid is dark-coloured, so as to enable it to absorb any superfluous rays of light. The pupil has the power of contracting and dilating in order to regulate the admittance of light.

Simple Ophthalmia (*Conjunctivitis*)

is inflammation of the membrane (the conjunctiva) which covers the surface of the eye, and lines the eyelids. It may be induced by mechanical injury or cold.

When it is caused by a blow directly inflicted on the cornea, the opacity will radiate from the point struck. This appearance, which serves to distinguish the affection from that due to cold, will not be present when the eye has been injured at a moment when it was protected by the eyelid. In catarrh, both eyes are usually affected; but in ophthalmia from injury, only one eye is as a rule inflamed. The presence or absence of other signs of catarrh will also help in obtaining a correct decision. In ophthalmia from a blow, there will often be a mark of the injury on the skin of the eyelid. In catarrh ("running") of the eyes, the opacity commences at the inner corner of the eye.

SYMPTOMS.—The eye has the appearance of having received a blow. The eyelids are closed and swollen. The eyeball is drawn back. Tears flow copiously. The haw projects; and there is intolerance of light. The conjunctiva is inflamed. The cornea gradually becomes clouded by an opacity which appears to be superficial and of a bluish colour; characteristics which distinguish this disease from periodic ophthalmia (p. 341).

TREATMENT.—Examine the part to see if there be any external injury. If a foreign body be found in the eye, remove it carefully. To do this, and also to facilitate examination, it is well to produce insensibility of the part by applying to the surface of the eyeball a few drops of a 5 per cent. solution of hydrochlorate of cocaine (p. 608) in water, or we may have to pull back the haw by transfixing it with a needle and thread. Give a dose of physic, and keep the animal on laxative food. Foment the part with warm water, and keep the horse in darkness. From time to time smear the skin round the eyelids with extract of belladonna, which can be made to adhere by mixing it with a little glycerine; or place in the eye a few drops of liquor atropinæ sulphatis. The belladonna, by virtue of its active principle, atropine, relieves the congestion of the blood-vessels by causing their mus-

cular coats to contract. If the eye remains weak, it may be stimulated by the application of a few drops of—

Nitrate of silver ...	... ...	2 grains.
Or, sulphate of zinc	... ...	3 „
Or, alum...	... ...	6 „
Water ...	... ...	1 oz.

Periodic Ophthalmia, or Moon Blindness.

CAUSES AND NATURE.—This somewhat rare disease appears to be brought on by bad sanitary arrangements; and, according to Percivall, by the injurious influences of wet, marshy pastures

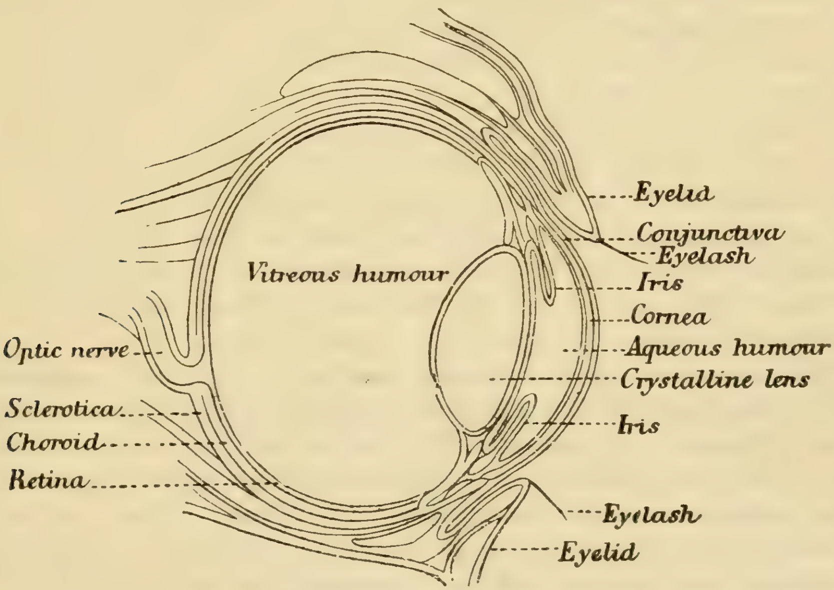


Fig. 140.—Longitudinal and vertical section of eye.

on which horses are reared. In its production, hereditary predisposition plays a large part. For instance, using, for stud purposes, stallions whose eyes were affected, was formerly a frequent cause of blindness among Irish horses. The frequency of its occurrence has diminished in direct proportion to the improvement which has been made in stable life, especially as regards ventilation, and the consequent removal of the irritating presence of ammonia. As I have never seen a case of periodic ophthalmia in horses which had been always kept under healthy conditions, I look upon it as a disease due to chemical or mechanical irritation, and not as an infective malady.

This disease appears to be an inflammation of the whole structure of the eye; but in simple ophthalmia, only the membrane which covers the eye is affected. It is generally confined to one eye.

SYMPTOMS AND COURSE.—The symptoms come on suddenly, and resemble those of simple ophthalmia, except that the interior of the eye assumes a dim, dull, amber-coloured appearance; and the cornea becomes clouded. At first the pupil is contracted. In conjunctivitis (p. 340), the inflammation is confined to the surface of the eye.

Usually the intensity of the symptoms begins to abate after about a week, and the cornea and conjunctiva gradually assume, more or less, their normal condition. Gamgee observes that "the first attacks are usually the longest, and their duration diminishes, as a rule, with their recurrence. During the progress of apparent recovery a relapse is not unfrequent, and the term may be thus indefinitely lengthened. The interval between the attacks is, on an average, about sixty days. The eye may seem quite clear during the intermission; but it has not returned to its normal condition. The outline of the upper eyelid is usually altered. It presents a slight bend in its internal part, so that the upper joins the lower lid, at the inner angle, by a right, in place of an acute, angle. This is best marked after several severe attacks, and gives a triangular outline to the opening between the lids." There may be recurrent attacks after the horse has become totally blind.

Williams notes the peculiarly wrinkled or furrowed appearance which the upper lid and eyebrow assume. The eye appears smaller than it would do in health, and looks dull and weak. In confirmed cases, the haw is prominent; the cornea, more or less opaque; and the iris and aqueous humour, changed in colour. These indications would probably be of use to an intending purchaser. This disease generally terminates in cataract; although the latter affection may come on independently of the former.

TREATMENT.—In "The Journal of Comp. Medicine," Nov. 1893, Dr. R. H. Harrison (U.S. of America) strongly recommends puncturing the cornea (p. 346) for periodic ophthalmia, if the operation is indicated after testing the tension of the eyeballs, which, he tells us, "is a useful and important guide in determining whether to operate or not. In testing the eyes I have found the most practical way is to exert alternating pressure of two fingers placed on the upper lid, testing both eyes at once, using the index and middle fingers of both hands on the eyes. In this way, a slight variation of the tension of the two eyes can be determined. If found harder than normal, the operation is indicated;

but, if softer, most emphatically contraindicated, for surgical interference means an early and incurable blindness. . . . It is well to remember that, when one eye is affected with this disease, the other will, as a rule, become affected sooner or later. This should be especially remembered, for when you have one eye cleared up and apparently sound, a month or two later you are called to test the other eye, affected more or less severely from sympathy, direct nerve influence, or infection." Dr. Harrison allows an escape of aqueous humour sufficient to give the cornea a flattened appearance. "Care must be exercised that the flow of the fluid is very gradual, so that the lens may not be torn from its attachments, or the iris involved." In operating on the apparently sound eye, a smaller quantity of aqueous humour is allowed to escape. Out of 100 cases in Dr. Harrison's practice, 80 recovered, 10 showed an improvement, and 10 did badly. Veterinary Surgeon Desmond has also had excellent results from this operation in periodic ophthalmia.

Cataract

is an opaque condition of the crystalline lens, or of its capsule, or of both structures at the same time, by reason of which the light that enters the pupil is obstructed on its way to the retina; blindness, total or partial, being the natural result. A cataract may consist of only a small white or bluish-white spot which slightly obscures the vision, and it may then be the cause of shying in the animal; or it may completely cover the affected structures. In the former case, if the horse be taken into a dark room and the eye be examined by the light of a candle, the speck may be seen through the pupil, which will, more or less perfectly, contract or dilate on the approach or removal of the taper; but in the latter, the cataract will appear like a white curtain drawn across the opening of the pupil, which will probably then be quite insensible to the action of light. A careful comparison of the behaviour of both eyes under the influence of the light of a candle in a room in which there is no other source of light, will aid the correctness of the examination. White specks on the cornea should not be confounded with cataract.

An examination of the eyes in daylight is apt to lead an inexperienced observer into error, owing to the fact that light reflected into the eye from white objects, such as white-washed walls, white clothing, etc., causes the formation of white images within the interior of the eye.

The presence of cataract may be tested—under ordinary circumstances—by holding upright a lighted candle in front of the sus-

pected eye, in which, if it be healthy, three vertical reflections of the candle will be seen, namely, one on the cornea, a second on the front of the crystalline lens, and a third, turned upside down, on the back of the lens. The inverted position of the last-named image is due to the fact that the rays of light become refracted on passing through the lens. If the candle be moved from right to left, the first and second images will move in the same way, while the third will go from left to right; and *vice versâ.* When the cataract is complete, it will naturally prevent the formation of the third image. Old cataracts have a pearly white appearance. Newly formed ones are bluish in colour.

The operation for cataract, namely, the removal of the more or less opaque lens from the eye, would probably give good results in the horse; for men and dogs which have been operated upon, generally recover their sight sufficiently for all ordinary purposes of locomotion in the open, even without the aid of glasses. One of the best methods of operating for cataract consists in (1) applying a 10 per cent. solution of the hydrochlorate of cocaine to the cornea to deaden pain and dilate the pupil; (2) making an incision through the upper portion of the cornea; (3) pressing the lower part of the eyeball with the fingers, so as to displace the lens, and force it out through the pupil and towards the opening in the cornea; (5) removal of the lens through the incision; and (6) dressing the part. The operation should be performed under as perfect antiseptic precautions (p. 70) as possible, and, in all cases, by a skilful veterinary surgeon.

Cataract is, of course, an unsoundness (*Higgs v. Thrale,* 18th Feb., 1850).

Turning-in of the Eyelashes.

This irritating action on the part of the eyelashes often causes inflammation of the eyes, and can be best removed by snipping off the offending hairs with a scissors. The eyes can be bathed with warm water, in which a little salt (a teaspoonful to a pint of water) has been dissolved. As long as the irritation lasts, the eyes should be protected from light.

Worm in the Eye

is caused by the presence of a thread-like worm in the aqueous humour of the horse's eye. According to the observations made at Karnal and Saharanpur by Dr. Lingard, this parasite averages about an inch in length, the female being slightly longer than the male. Dr. Lingard agrees with Neumann in considering that

it is the immature (unmarried) form of the *filaria equina* (*filaria papillosa*), which is sometimes found in the peritoneal cavity (p. 114) of horses. This disease is rarely met with, except in India, where it is frequently seen in some districts.

SYMPTOMS.—The first sign of the worm is a slight dimness or milky appearance of the cornea, which is due to inflammation caused by the presence of the worm; and beneath the cornea the parasite may often be seen moving about in the anterior chamber of the eye. Not unfrequently, while the eye remains moderately clear, the worm suddenly disappears, and then, after some time, comes into view again. In such a case, it inserts itself, for the time being, between the iris and the lens. The fact that simple ophthalmia is accompanied by an inflamed appearance of the eyelids, which is its first symptom, serves to distinguish it from "worm in the eye," the inflammation of which, unless in very advanced cases, does not extend to the eyelids. The cornea of the filaria-affected eye, generally, assumes an evenly distributed dimness, which, as a rule, rapidly increases, until the opacity becomes more or less complete. If there be any difficulty in seeing the parasite through the inflamed cornea, the horse should be taken into a dark place, and the eye examined by means of a candle. When the inflammation of the cornea is in its first stage, it may subside to some extent, and the eye may become clearer on account of the parasite ceasing to irritate the parts by inserting itself between the lens and the iris, and remaining there for some time. There will usually be a slight flow of tears from the eye; which, however, will (unlike an eye suffering from simple ophthalmia) evince but little intolerance of light. If we suspect that the filaria is hiding between the lens and the iris, we may discover its presence in the following manner which has been devised by Mr. Spooner Hart, M.R.C.V.S.:—"Place the patient in a darkish stable, and let the light shine into the affected eye from the front and a little to the side of the head, just above the level of the eye, so as to render the interior of the eyeball luminous, and stand about four or five yards off in the line of the light, when a gigantic worm, moving about inside the eye, will be visible." Hart remarks that he has never seen more than one worm in the same eye at the same time. My Indian experience, on this point, is the same as his; although I have seen a horse in Cambridgeshire, in one of whose eyes I observed several (apparently four or five) filariæ moving about. It occasionally happens, even in cases which receive no treatment, that the worm disappears from the eye and leaves no trace behind. The usual ending of untreated cases is that the inflammation caused by the presence of the worm proceeds

to such an extent, that the cornea becomes opaque, and the horse loses the sight of the involved eye.

Respecting the ability of a worm to insert itself between the lens and the iris, we may see that in Fig. 140 there is a space shown between these two structures, which has been made merely for clearness sake; but it is probable that during life, the margin of the pupil remains usually in contact with the lens, unless when the pupil is dilated. At the same time, the contact is loose enough to allow the worm to wriggle itself between the lens and iris. The use of belladonna in the treatment of the inflammation of the eye, is to prevent the iris, at the edge of the pupil, from permanently adhering to the lens, which, if it remained in contact with the lens, it would be apt to do, owing to the adhesive nature of the inflammatory exudation. The use of atropine (the active principle of belladonna) obviates the risk of adhesions being formed, by causing the radiating muscular fibres of the iris to contract, and, thus, to draw the margin of the pupil away from the lens.

TREATMENT.—The moment we have found out what is the matter with the eye, we should proceed to remove the parasite; for the longer it stays in the eye, the more harm, as a rule, will it inflict on that organ. The usual manner of operating is as follows; the only instrument required being a Græfe's or Beer's cataract knife. Vet.-Captain Appleton recommends a large suture needle, because it readily punctures the cornea, and is not liable to hurt the iris, on account of its curved shape. If none of these instruments be available, we may use a fine-pointed lancet, the point being guarded by thread wrapped round the blade, so as to leave about a quarter of an inch bare. The horse should be cast on the side opposite to that of the affected eye, and in such a manner that there will be a good light on the part. A truss of straw should be placed under his head, which should be steadied and kept down by the assistance of a couple of men. The horse should be put under chloroform, or the surface of the eye and haw (*membrana nictitans*) rendered insensitive by placing on it a few drops of a 10 per cent. solution, in water, of the hydrochlorate of cocaine about ten minutes before making the incision. I would also advise the use of a solution of atropine (p. 601). Before operating, it is well to wash the eyelids and skin around the eye with warm salt water (a teaspoonful of salt to a pint of water). The hands and lancet should be thoroughly disinfected (p. 70). The operator should kneel down behind the horse's poll, and holding the lancet between the finger and thumb, while resting the hand close to the eye and keeping the point of the instrument almost touching the eye at the spot where it is intended to puncture,

he should wait until he finds the worm in a convenient position to make its exit; for, if it be hidden away behind the iris, the operation most probably will be in vain. If the parasite is not between the iris and cornea, he should wait until it comes in sight before commencing. He should then make the incision by a strong, firm pressure. The direction of the puncture should be more or less parallel to the iris, so as to avoid wounding that structure; and close to where the cornea joins the white of the eye, and on the outer or inner upper margin, as may be most convenient. To facilitate the escape of the aqueous humour, the knife should be allowed to remain in the eye, as long as the fluid continues to flow, and very slight pressure may be made with the finger on the cornea, if necessary. When the wound is thus made obliquely to the surface of the cornea, its edge will unite more readily than if the puncture was made at right angles —to say nothing about the danger to the iris. Our object in making the opening high up, is to have the subsequent scar covered by the upper eyelid, so that it will be neither visible under ordinary circumstances, nor liable to interfere with the rays of light which may enter the pupil. Besides, the higher it is, the less will be the danger of too great an escape of fluid. A "transfixion forceps," which has two fine points for insertion into the surface of the eye, will be useful here for steadying the eye, if cocaine is not used. If the iris is touched by the knife in operating, it will bleed, and will probably fill the chamber with blood; but this complication will pass off in a few days. In the majority of cases, the worm seems anxious to quit the eye; for it will generally make its escape if the aperture is big enough, even if it has not been drawn through by the first rush of fluid. When the parasite remains in the eye after the operation, the escape of the fluid will often cause its death. If the puncture be unsuccessful, we may repeat it after a fortnight, by which time the anterior chamber of the eye will again become filled with fluid.

If the iris has been wounded, and on that account protrudes through the opening in the cornea, we should, as advised by Mr. R. Spooner Hart, wait a little time until the inflammation has subsided, and then, while the eye is under the influence of cocaine, snip off the protruding portion with a pair of curved scissors.

The subsequent treatment of the wound made by the operation consists in protecting it from injury and irritation, and furthering its cure. With this object, we may, as recommended by Hart, put the patient on the pillar reins for about a week, keep the eyelids smeared with extract of belladonna (made up with a little glycerine, for instance), and shade his eyes from light. If necessary, the eye

might be cleaned by gently syringing it with lukewarm water in which boracic acid (say, 25 grains to the ounce) has been dissolved.

The practice of puncturing the cornea while the horse is standing, is too dangerous to the eye to be adopted.

Colonel Nunn performs the operation with a Beer's or Græfe's cataract knife, and makes the incision only just large enough to introduce a human iris forceps, with which he seizes and removes the worm. These instruments should be disinfected (p. 70) before use.

Worms under the Eyelids (*Extra-ocular Filariasis*).

The presence of thread-worms between the internal surface of the eyelids and the ball of the eye, sometimes causes considerable irritation of the part; the chief symptoms being weeping, intolerance of light, opacity of the cornea, and tenderness. In old-standing cases, the cornea may become rough and scaly. The worm in question (*filaria palpebralis*) varies from $\frac{1}{4}$ to $2/3$ inch in length. It is occasionally found in the canal (lachrymal canal) through which the watery fluid of the eye escapes into the nostril.

TREATMENT naturally consists in the removal of the worm, or worms, which may be done by opening the eyelids, gently syringing the part with warm saltish water (a teaspoonful to the pint), or with a warm solution of boracic acid and water (5 grains to the ounce of water), and picking out the worms when they come into view. The manipulation in this case will be aided by placing in the affected eye a few drops of a 5 per cent. solution of cocaine, which, in about ten minutes, will render the surface of the eye insensible to pain, for several minutes.

Amaurosis, or Glass Eye,

is not a disease of the eye itself; but is the condition of an eye in which there is loss of function of the optic nerve, which form of paralysis renders the retina insensible to the action of light. It may be due to some affection of this nerve, or to sympathetic causes. If it be owing to the former, it will be incurable; if to the latter, it will probably disappear when the original disease is relieved. The functions of the optic nerve may become arrested by pressure on it from tumours in the brain, or by the loss of its blood-supply from the blocking up of the small artery which is in the centre of this nerve. A blow, a sudden shock, or a flash of lightning close to the eye may, also, render it amaurotic.

In the majority of cases, both eyes are affected. The presence of the disease can be known by the fact of the pupil remaining

dilated and immovable under the influence of light. The interior of the eye looks bright, healthy, and somewhat clearer than natural —in fact, it looks glassy; hence its common name.

The eyelids are opened wide; and when both eyes are affected, the animal's action and appearance denote that he is blind.

If only one eye be amaurotic, its pupil will contract when light falls on the sound eye; but if the blind eye be alone subjected to the influence of light, neither its own pupil nor that of the healthy one will contract. The influence which the sound eye has on the blind one, is owing to the distribution of the optic-nerve fibres; there being a nervous connection between the two eyes, as well as between each eye and the opposite nerve root. That portion of the nerve which proceeds from the blind eye to the brain, having lost its function, is unable to influence the healthy eye.

CHAPTER XVIII.

Diseases of the Organs of Breathing.

SKETCH OF THE ANATOMY OF THE ORGANS OF BREATHING—GENERAL REMARKS ON PNEUMONIA, PLEURISY, AND BRONCHITIS—PNEUMONIA—PLEURISY—BRONCHITIS—CONTAGIOUS PLEURO-PNEUMONIA—GENERAL TREATMENT OF PNEUMONIA, PLEURISY, AND BRONCHITIS—BOARD-SHIP SEPTIC PNEUMONIA—CONGESTION OF THE LUNGS—SORE THROAT—ACUTE NASAL CATARRH—COUGH—BLEEDING FROM THE NOSE—NASAL GLEET—BROKEN WIND—ASTHMA—ROARING—THICK WIND—HIGHBLOWING.

Sketch of the Anatomy of the Organs of Breathing (*Fig.* 141).

The passages from the nostrils open into a cavity called the *pharynx*, which also communicates with the mouth through an opening termed the *isthmus*, over which the *soft palate* is suspended, like a valvular curtain, in order to keep it shut, except during the passage of food and water; hence, the horse is unable to breathe freely through his mouth. The *windpipe*, or *trachea*, opens into the pharynx by means of a short cartilaginous tube, the *larynx*, which is the organ of voice, and is situated between the angles of the branches of the lower jaw. When it is inflamed, we have laryngitis, or sore throat. The larynx is guarded from the entrance of food, water, &c., by a cartilaginous valve called the *epiglottis*, over which the mouthful of food, or "go-down" of water, passes. The windpipe, or trachea, is an elastic tube formed of incomplete cartilaginous rings. It terminates at the base of the heart, and splits up into two tubes—the right and left *bronchi*—which respectively go to the right and left lung. These bronchi further subdivide into a great number of branches called the *bronchia*, or *bronchial tubes*, which finally open into the *air-cells* of the lungs. "The entire ramification when isolated has the appearance of a tree, the trachea being the main trunk; the bronchi and bronchial tubes, the branches; and the air-cells, the leaves" ("Strangeways' Anatomy"). The nasal passages, the pharynx, larynx, and bronchial tubes, are lined with mucous membrane. Thus, in sore throat and bronchitis (inflammation of the bronchial tubes), we have, at first, a dry and inflamed condition of this mucous membrane, succeeded by an increased secretion of mucus.

The mucous membrane is what we may call the internal skin which lines various hollow organs, such as the nostrils, windpipe, mouth, gullet, stomach, intestines, eyelids, interior of the ears, bladder, and urethra. It secretes a slimy fluid (*mucus*), which is known as "phlegm," when it is discharged from the windpipe.

The *lungs* are composed of a spongy substance, which is made up of a vast

number of small *lobules* that are connected together and kept separate by cellular tissue. Each of these lobules is composed of many minute air-cells, and is supplied with a small bronchial tube, which conveys air to these cells. The capillary blood-vessels are distributed through the walls of the air-cells, so that while the air in one cell acts on one side of a capillary, the air in the adjoining cells acts on the other side. The blood thus brought into extremely close proximity with the air contained in the cells, while traversing their walls, takes up the necessary supply of oxygen for the requirements of the system, and, on its return to the lungs, gives off the carbonic acid which

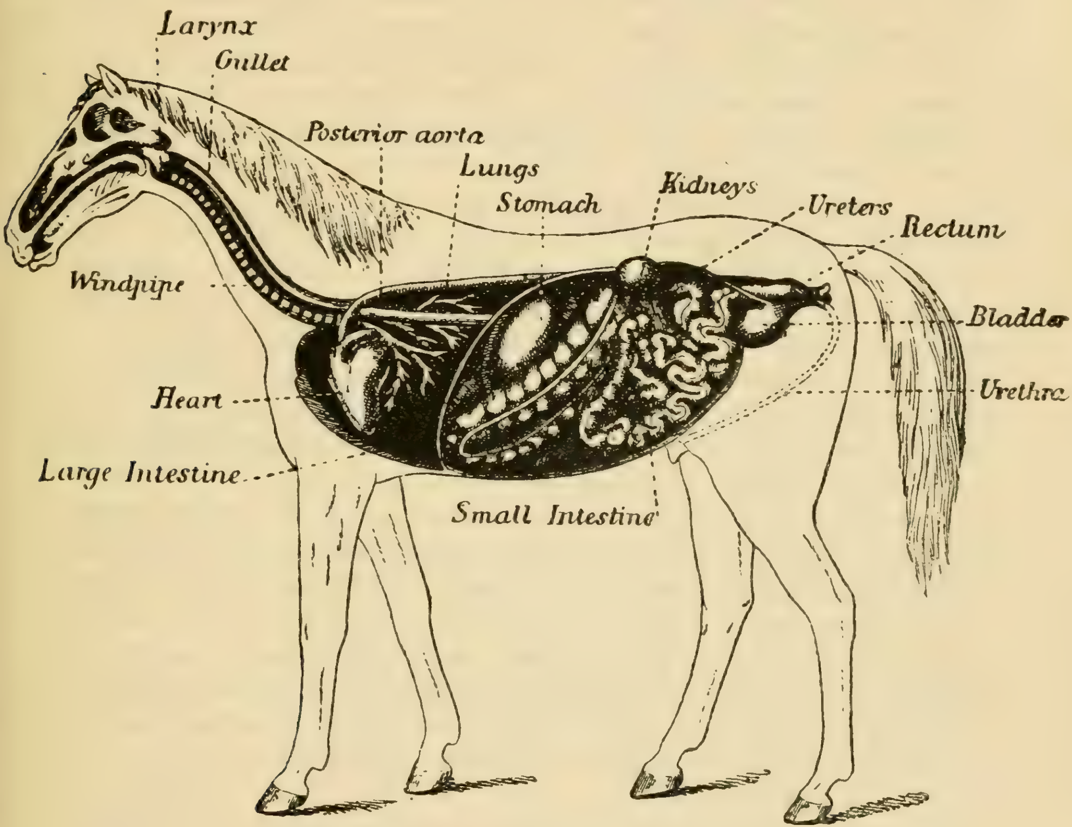


Fig. 141.—Internal organs of the horse.

it absorbed from the various tissues. The skin, to a small extent, also excretes carbonic acid.

The *pleuræ* are two smooth and glistening membranes which line the cavity of the chest and cover the lungs, thus forming two closed sacs; their office being to prevent friction between the lungs and the walls of the chest. They secrete serous fluid (p. 13) with which to lubricate their inner surface.

General Remarks on Pneumonia, Pleurisy, and Bronchitis.

The lungs are so intimately connected with the bronchial tubes and the pleuræ, that they are rarely affected without either of the other two structures being also implicated; and, if either of

them becomes inflamed, the lungs will in all probability, participate in the derangement. Hence, we more frequently find broncho-pneumonia, or pleuro-pneumonia, than pneumonia, pleurisy, or bronchitis in a pure form. I shall briefly describe the respective symptoms of the three last-named diseases, so that the reader may draw his own inferences in complicated cases, which present far too great a variety to admit of detailed description; and shall, finally, give the general treatment which is applicable to all of them, with such special directions as the symptoms may indicate.

Generally speaking, these diseases occur in four ways: (1.) By exposure to cold, especially in combination with a damp and draughty condition of the surrounding air, and when the system is over-heated, debilitated, or exhausted from excessive exertion. (2.) By some mechanical irritant, as may happen when a drench of turpentine and oil "goes the wrong way"; or when the sharp end of a broken rib pierces the lung. (3.) As secondary diseases; for instance, when the lungs become invaded with the abscesses of glanders. Under this heading we may include embolic pneumonia, as in inflammation of veins (p. 117). This complication sometimes follows strangles, and other inflammatory conditions which are accompanied by the formation of pus. (4.) As infective diseases; in which case, there is strong reason for believing that they are diseases which involve the entire system, and have a local manifestation in the organs of breathing. The practical considerations which bear out this view are as follows: (*a*) These diseases often assume an epizootic type. (*b*) They run a regular course of about a week or ten days. (*c*) The treatment which best succeeds, is one based on the theory that the disease is caused by the presence in the system, of some virus, to remove which we should consequently direct our efforts, while at the same time we should support the animal's vital powers.

The word "epizootic" is applied to animals, in the same manner as "epidemic" is to men.

In these diseases, as in all other inflammations, there is an escape of watery fluid (plasma, p. 12) from the vessels of the inflamed part, which plasma at first becomes solid, and afterwards breaks up, and is more or less removed.

As an uninstructed observer of these chest disorders will often be unable to detect the disease in its first stage—the horse, at the outset, usually appearing to him to be simply dull and out of sorts—the attack will in many cases have run a part of its course before its existence is suspected.

Horse owners should remember that of all stables liable to induce chest diseases, ill-ventilated, damp and draughty ones are the worst.

Generally, in these complaints, the horse refuses to lie down; the bowels are costive; and the dung mixed with flakes of mucus, the presence of which indicates irritation of the intestines, and, therefore, the non-administration of aperients, which are irritants to the bowels. The rate of breathing (ordinary rate when at rest, 12 or 13 per minute) is increased.

"Respiration in the horse is more regular than in the other animals, and an increase in rate of breathing, when the animal is at rest, always indicates some derangement; at the same time the careful examiner, even in the case of the horse, pays more attention to the peculiarity of the respiratory action than to the frequency of the act" ("The Field").

Pneumonia (*Inflammation of the Lungs*).

This disease is usually defined as inflammation of the substance of the lungs. It is rarely, as before mentioned, seen in an uncomplicated form. Pneumonia often follows congestion of the lungs. In a regular attack, there are three stages, namely, engorgement of blood, consolidation of the inflammatory products in the lung tissue, and softening or breaking up of these products. The accompanying fever may kill during the first stage; as it is then at its greatest intensity. The animal may die of suffocation in the second stage, if a large amount of lung tissue be involved. The attack may prove fatal in the third stage by blood poisoning, owing to the absorption of diseased material thrown out by the lungs.

Dr. Andrew Smith ("Twentieth Century Practice of Medicine") brings forward strong proof that human pneumonia is not an inflammation of the lung, but is simply a process of germ culture in the air cells.

SYMPTOMS.—Dulness and depression of spirits. High fever, which is generally accompanied by shivering fits. Frequent pulse; often over 80 per minute. The breathing, which is of the chest form, being chiefly performed by the ribs, soon becomes rapid and "shallow," being sometimes over 50 per minute (normal rate, at rest, about 12 or 13), but without marked pain, unless when complicated by pleurisy. The nostrils are widely distended. Friedberger and Fröhner state that the fever (as shown by an internal temperature (p. 681) of from 105° to 106½° F.) lasts about six days. The cough at first, if it be present, is full and strong, and very unlike the suppressed, painful one of pleurisy. When consolidation of the lung, however, takes place, the cough becomes small, as if proceeding from a solid body. The mucous membranes

of the nostrils and eyelids are red, congested, and frequently tinged yellow with bile. There is often a slight, "rusty," yellow discharge from the nostrils. The eyes are bloodshot. If the attack be but slight, the exudation may become absorbed before consolidation sets in, and the lungs may recover their healthy condition without further change.

If the horse does not succumb during the first stage, the fever gradually subsides; the pulse falls; the temperature becomes lower; the appetite returns; and the urine, which was previously scanty, is abundant. The rate of breathing, which had decreased with the abatement of the fever, now increases in rapidity, in order to make up for the partial loss of function which the lungs have sustained, owing to the consolidation of a portion of their substance. In the third stage, the cough, if present, is moist and full. There is a free discharge of phlegm, etc., from the lungs, and, if the case ends favourably, the breathing becomes normal.

Pleurisy

is inflammation of the pleuræ, which become dry during the first stage of the attack; hence the observer, on applying his ear to the horse's side, may ascertain the presence of the disease by hearing the crackling, or "friction sound" caused by the dry and inflamed surfaces of the pleuræ rubbing against each other, as the lungs move backwards and forwards against the sides of the chest when the animal breathes. The sound somewhat resembles that emitted by two dry pieces of bladder when rubbed together. Owing to the pleuræ forming closed serous sacs, we always have, after an attack of pleurisy, an effusion of serous fluid into them, constituting "water on the chest" (hydrothorax) of varying quantity. There is, also, an exudation, which is deposited on the pleuræ, and which becomes more or less organised.

SYMPTOMS OF PLEURISY.—Pleurisy generally attacks only one side of the chest, that being the right, in most cases. At first, the symptoms usually resemble those of colic, except that the pain is constant and not intermittent, and there is inflammatory fever. The horse shows great disinclination to move. There is considerable distress. In mild cases, the colicky pains are often absent. A shivering fit frequently precedes the attack. The affected side is tender to the touch. The breathing is quick and short, and the flanks heave—which fact shows that the animal endeavours to breathe as much as possible by the action of the muscles of the abdomen, and not by the movement of his ribs,

which are in close proximity to the inflamed pleuræ. The nostrils are dilated. There is usually a dry, short, painful cough present, which is repressed by the animal, as much as possible, so as not to shake the inflamed parts. Often, during expiration, the horse gives a painful grunt, especially when he is made to move. The pulse is generally hard and frequent, or it may be weak and oppressed, and not much more frequent than usual. If the ear be applied to the affected side, the dry crackling or friction sound can be heard.

The three characteristic signs by which pleurisy, in its acute stage, may be recognised are: the peculiar friction sound heard on applying the ear to the affected side; the short, dry, painful, and suppressed cough; and the abdominal breathing, made evident by the existence of a groove on the lower part of the false ribs and abdomen. This groove, as we may see in Fig. 142, is directed slightly upwards in its backward course.

In the second stage, the fever abates and the pain decreases. If there has been a large effusion of serous fluid (causing hydrothorax or dropsy of the chest), the breathing becomes accelerated, owing to the mechanical impediment offered by the fluid to the expansion of the lungs; "the pulse small, quick, soft, often intermittent; auscultation reveals absence of sound in the inferior part of the chest, or a sound resembling that of drops of water falling into a well" (*Williams*). Auscultation is the act of observing the sounds given by the chest, on applying the ear to the side. Dulness of the lower portion of a chest which contains serous fluid, may be observed on tapping the part with the tips of the fingers.

Bronchitis

is inflammation of the bronchial tubes. The lymph thrown out on the surface of the air passages may become organised, and may, consequently, cause obstruction to the air that is breathed, as may be indicated by the animal "making a noise," or by his becoming thick-winded. Infiltration may also take place into the substance of the lungs, causing the implicated part to become solidified, and, consequently, to lose its function.

SYMPTOMS OF ACUTE BRONCHITIS.—The breathing is very hurried but not painful, unless complicated by pleurisy. High temperature, which, as a rule, does not last beyond the third day. Frequent pulse. The lining membrane of the nostrils and eyelids is of a dark red colour, which may have a purple tinge from deficient oxidisation of the blood. The animal is dull and listless.

The cough during the first stage is dry and more or less painful, but not so painful as that of pleurisy, which is also short and suppressed. After a few days, the cough becomes soft and moist, and is accompanied by a copious discharge from the nostrils. If the ear be applied to the side, a gurgling sound caused by the passage of air through the inflamed tubes, which are more or less blocked up with phlegm, will be heard.

Contagious Pleuro-Pneumonia.—See page 466.

General Treatment of Pneumonia, Pleurisy, and Bronchitis.

PRINCIPLES OF TREATMENT.—Pneumonia, pleurisy, and bronchitis appear as a rule to be diseases which have their respective local manifestations in the lungs, pleuræ, and bronchial tubes, and which have a definite course to run. Our efforts, therefore, should be directed to tiding our patient over the dangerous period during which the disease remains in his system; careful nursing being the best means by which we can accomplish that desirable object.

Veterinary surgeons and farriers of former days killed so many horses by the indiscriminate and heroic manner in which they bled their patients, that the inevitable reaction has caused the almost complete abandonment of *bleeding* in equine practice. It is, however, the one sovereign means for reducing high arterial pressure (p. 17), which is frequently met with in cases of chest diseases; and its necessity will be indicated or disproved by the state of the pulse. With respect to the pulse of high arterial pressure, Hamilton says: "The mere feeling imparted to the finger is deceptive, for a pulse of high tension may be either large or small. The high tension may be associated with an exhausted heart, and hence the pulse may be small, a condition which, as Mahomed rightly remarked, is usually thought to require stimulation, but which in reality is much benefited by depletion. Of all the characters of a high-pressure pulse, according to the same authority, the least constant is hardness and incompressibility. Many pulses of high tension certainly possess this character, but not all. A pulse of undue length and of a pushing character is a more reliable indication. It is long, persistent, and hard. It is the pulsus tardus, or 'long pulse,' of the older physicians, the expression of a heart labouring against undue resistance." In the diseases we are considering, there is great waste of tissue, with little or no appetite, and, consequently, rapid emaciation. Even if food were forced on the patient, he would be unable to digest it. There is, therefore, imminent danger of his sinking from exhaustion before the disease has run its course. Hence, we should refrain from bleeding, which under ordinary circumstances would have a debilitating effect, unless when it is clearly indicated, as it is in a state of high arterial pressure.

Counter-irritation (chiefly blisters) as a relief for acute chest inflammation, has been used in the same rule-of-thumb manner as bleeding, and has accordingly wrought great harm on horses. Its principles of application are discussed on page 17. We are all familiar with the fact that counter-irritation applied to one part of the system, has the effect of diminishing congestion of blood in another part, as for instance, blistering the back of the neck, or placing the feet in a bath of warm water and mustard, in the case, with ourselves, of "fulness of blood to the head." As the state of the internal temperature will be a fairly safe guide to the degree of violence of the inflammation; we may accept the fact of the internal temperature being high, as

Fig. 142.—Horse dying from septic pleuro-pneumonia.

an indication for stimulating the skin, which is most conveniently done with mustard, and which, in the cases we are at present considering, is almost aways followed by a marked fall in the temperature. Contrary to the ordinary custom, I would advise that the counter-irritant should not be applied to the sides of the chest, for great distress may ensue from such a procedure, on account of the skin of that part being in a state of constant movement in breathing; and I think it best to apply it to parts which are at rest, such as the muscles of the limbs. At the same time, we must not ignore the fact that many practitioners who have had long practical experience, advocate blistering the sides in chest cases. On the other hand, Williams and several other sound authorities are opposed to any form of blistering in such cases. If we wish to steer a middle course, we might limit the use of counter-irritation to those cases in which the height of the internal temperature indicates to us that the life of our patient is in danger.

Heat (as for instance by warm fomentations) applied to the surface of the body will act as a mild counter-irritant. As, besides reducing internal temperature, it produces a soothing effect on the system, it should, as a rule, be employed; care of course being taken that the animal does not become chilled during the interval between the taking off of one fomentation and the application of another.

Strong *purgatives* should on no account be given; for in these diseases, the mucous membrane of the intestines, being in close sympathy with that of the organs of breathing, is in a more or less irritable condition. Consequently, the effect of a severe purgative would be to set up fatal superpurgation, or to seriously aggravate the disease. At the same time, we should keep the bowels in a slightly laxative condition, so as to favour the excretion of waste products. As the blood is the vehicle by means of which the waste materials of the body are removed, it becomes loaded with them, during inflammatory disease, owing to the increased waste of tissue. When the blood is in this state, the various organs of breathing are unable to perform their respective functions with their normal facility, and, as the presence of inflammation also impedes the function of a part, it follows that we should in these diseases, try to maintain the purity of the blood. Hence, we allow a free supply of fresh air for furnishing oxygen to the lungs; we apply warm fomentations to encourage excretion from the skin; we give, to a moderate extent, diuretics, such as nitre, and sweet spirits of nitre, to act on the kidneys, the office of which is to remove waste material from the blood; we allow a full supply of pure drinking water, to dilute the blood mass; and give laxative food to act lightly on the bowels; and, if necessary, a gentle aperient. In cold weather, clothing will be necessary, in order to keep up the temperature of the surface of the body; but it should be porous, so as not to check evaporation from the skin.

We should keep up the strength by suitable food, and slight stimulants judiciously given. We may give occasionally chloral hydrate, chlorodyne, or extract of Indian hemp, to soothe pain.

Every means should be taken to avoid exciting the animal; for excitement will be followed by an increase in the rate of the beats of the heart, and a consequent strain on the inflamed organs. As heat is a sedative to the organs of breathing, the animal should be kept in a warm, though thoroughly well-ventilated stall.

PRACTICAL TREATMENT.—The great secret of success is to take the case in time. The horse should be kept in a large, comfortable box, well ventilated, but entirely free from draughts. It is most important, in these cases, that the animal should be at once removed from a stable in which the air is foul, or in which there is not a free supply of pure air. If the bowels be costive, give an

enema of warm water; and if there is much depression, which would be caused by the accumulation of impurities in the blood, administer the following ball, which has long found favour among veterinary surgeons:—

Aloes	2 drachms.
Tartar emetic	1 drachm.
Nitre	1 ,,
Linseed meal, enough to make up the ball.	

Foment the sides with warm water for a couple of hours, dry the skin, and, in order to prevent the part becoming chilled, rub in the following liniment:—

Soap liniment	$\frac{1}{2}$ pint.
Strong liquid ammonia	1 drachm.

The fomentation may be arranged by soaking a blanket in hot water, wringing it moderately dry, placing it over the back and sides, and then covering it over with a waterproof sheet, or dry blanket. Before the first blanket is removed, a second one should be got ready; and so on. The water should not be so hot as to inflame the skin; for a soothing, not an irritating, effect ought to be the desired object.

After the fomentations are finished, clothe warmly, so that the skin may act freely. Hand-rub the legs well, rub in some of the soap liniment, and put on flannel or straw bandages to reach above the knees and hocks.

Give the animal plenty of cold water to drink, and keep him quiet. Let the food consist of gruel, bran and linseed mashes, scalded carrots, and green grass or lucerne. Give an ounce of nitre the first day in a mash or in the water, and half an ounce on the following day; stopping it when the urine becomes abundant. Drenching had best be avoided, as it distresses the horse.

If the breathing becomes distressed and the temperature very high (say, 105° F. or over), we may blister the hind quarters, or shoulders and fore-arms, with mustard, or, if the hair is long, with equal parts of camphor liniment and soap liniment; or with oil of turpentine diluted with twice the amount of sweet oil. Next day we may apply camphorated oil or sweet oil to the blistered parts to soothe and soften them.

If the pulse indicates high arterial tension (p. 356), we may bleed (p. 638) to, say, the extent of three quarts. Here, we should be careful to note any change which may occur in the character of the pulse.

If we find that the patient does well, simply by being carefully nursed, we should adopt no other treatment.

When the pulse loses its hard character, we may give, instead of the nitre, the following drench three or four times a day:—

Carbonate of ammonia	1 drachm.
Extract of belladonna	1 „
Sulphuric ether or sweet spirits of nitre...	1 oz.
Liquor ammonii acetatis	2 „
Water	1 pint.

Or,

Carbonate of ammonia	1 drachm.
Nitre	$1\frac{1}{2}$ „
Water	1 pint.

The carbonate of ammonia strengthens the action of the heart, lowers the temperature of the body, and by its alkalinity tends to preserve the fluidity of the blood.

If symptoms of pleurisy be well marked, and the pain be very acute, give—

Chlorodyne	$1\frac{1}{2}$ ounce.
Or, Extract of Indian hemp, B.P. ...	3 drachms.
Linseed oil	$\frac{1}{2}$ pint.

It is generally advisable to repeat this drench if the symptoms of pain continue to be urgent.

If, on the contrary, the symptoms of bronchitis be manifest, give in a ball—

Carbonate of ammonia	1 drachm.
Camphor	1 „
Extract of belladonna	1 „

twice a day. Steam the nostrils, and if the cough be hard, blister the throat with tincture of cantharides, or with the ordinary fly ointment (p. 602). If the throat be sore, no ball should be given, nor the carbonate of ammonia in any form, as its effects on the throat are very irritating. In this case, a drachm each of belladonna and camphor mixed with treacle may be placed, twice a day, between the horse's teeth, so that it may gradually pass down the throat.

I must caution the inexperienced horse-owner to carefully consider the symptoms; and, if he is not quite certain what is the right course to pursue with regard to the internal administration of medicine, I would strongly advise him to dispense with it, and to content himself with following the general directions laid down,

as regards fresh air, water, fomentations, warm clothing, laxative food, and nitre. In giving this advice to inexperienced horse-owners, I am of course assuming that they are unable to obtain the aid of a veterinary surgeon, who is the only person competent to intelligently treat such serious cases.

If there be great difficulty in breathing, which will occur when laryngitis (sore throat, p. 367) is present, tracheotomy may have to be performed. Although this is a very simple operation; it is generally advisable to defer it as long as possible, from the danger of its causing the horse to subsequently "make a noise," if the edges of the divided cartilage happen to unite in an irregular manner. When the animal's breathing becomes laboured, he should be carefully watched, and the operation performed the moment he begins "to fight for breath."

If diarrhœa sets in, it is not generally advisable to check it; as it is almost always an effort of nature to expel waste and deleterious matters from the system.

In the second stage, when the fever has passed off, corn should be gradually given, with, if much debility exists, a couple of quarts of beer a day, or skimmed milk and, say, a dozen raw eggs. Discontinue the nitre, and give twice a day in a pint of ale—

Powdered gentian or chiretta ...	3 drachms.
„ ginger	2 „
Sweet spirits of nitre	1½ oz.

Or,

Sulphate of quinine	1½ drachm.
Dilute nitro-muriatic acid	1½ „
Water	1 pint.

If the cough continues, blister the throat with cantharides. Nurse the horse, and attend to his general health.

The liver is frequently implicated in an attack of various chest diseases, as will be indicated by the yellow colour of the gums and lining membrane of the eyelids. The practitioner should, however, neglect such secondary symptoms, and attend solely to the alleviation of the original disorder; resting assured, that, as it subsides, the liver symptoms will gradually disappear.

Chest diseases are often far more serious than they appear to be at first glance. Hence, if the person who has charge of the horse suspects that there is anything wrong with the animal's organs of breathing, he should use, when possible, the clinical thermometer (p. 681); for there is always, during the acute stage of these attacks, a marked rise in the temperature of the body, with a corresponding degree of danger to the animal. This in-

strument will not only inform us of the extent of the danger; but will also give us timely warning of an attack before the usual symptoms become apparent.

Board-ship Pneumonia.

NATURE AND CAUSE.—This form of pneumonia is undoubtedly the most common cause of death among horses which are carried in large numbers by sea; but, as far as I can learn, it never appears among animals on land, or when the number of horses on board is very small, as in the case when they are taken in portable horse-boxes. It might be supposed at first sight, that the disease was due to defective ventilation; but experience shows us that when it breaks out, it affects not only horses in badly-ventilated stalls, but also those which are in places where the ventilation is of the freest possible kind, as for instance, in stalls facing large openings on the windward side of the ship. This fact strongly suggests the conclusion that the disease in question is due to an infection, which of course could not originate on board, but must have been carried into the ship. Some veterinary surgeons have suggested to me that it is due to stagnation of blood in the lungs, owing to want of exercise, but if that supposition were true, the appearance of the disease would be independent of overcrowding, which is not the case; and it would also occur on land, when horses are tied up for a long time. The clinical symptoms and the history of the cases suggest the theory that the disease is a form of contagious pleuro-pneumonia (p. 466) which has been aggravated by the unsanitary conditions of overcrowding.

I believe that I am correct in saying that this board-ship form of pneumonia is generally complicated by pleurisy. I have seen it break out among horses on board a ship bound to South Africa, three days after leaving England.

SYMPTOMS.—The animal is depressed, more or less off its food, and hangs its head. The eyes are generally closed to a greater or less extent, and are sometimes "weeping." The mucous membrane of the eyes is of an intensely red colour, which becomes darker as the disease progresses. If pleurisy also exists, its presence will be indicated by the heaving of the flanks and by abdominal breathing, which is manifested by the presence of a groove on the lower part of the side of the abdomen. The appearance of this groove is shown in Fig. 142 (p. 357), which is reproduced from a photograph I took, at Port Elizabeth, of a lately-landed horse that was in the last stage of board-ship pleuro-pneumonia. The nostrils are greatly dilated, and the breathing,

which is always hurried in such cases, often attains a rate of over 40 respirations in the minute. The constant noise and vibration on board a steamer in movement makes it very difficult, when pleurisy is present, to properly observe the characteristic sounds of that complication, which are similar to those of ordinary pleurisy. The pulse is very frequent; often over 70 in the minute. Although the appetite is more or less in abeyance, the patient will sometimes continue to nibble his hay to the very end, and not unusually dies with some hay between his teeth. As a rule, he drinks very little water, apparently on account of the hurried state of his breathing. The disease generally runs its course in about six days, during the last two or three of which there is a watery discharge from the lungs in varied quantities. Sometimes this discharge merely moistens the opening of the nostrils and the muzzle; but on other occasions the animal often licks it off his muzzle. At first it is colourless, but later on it assumes a rusty red tint, which indicates that putrefaction is present in the lungs. This discharge is accompanied by a fœtid smell from the nostrils, which increases in intensity according to the extent of the putrefactive condition of the lungs. Occasionally, the patient dies suddenly, but death as a rule is caused by exhaustion and inability to get a sufficiency of air into the lungs to sustain life.

RATE OF MORTALITY.—The large majority, probably over 80 per cent., of horses which become affected by this disease, die.

POST-MORTEM APPEARANCES.—Among the ordinary signs of pneumonia and pleurisy, I have always found an unusually large quantity of serum in the pleural cavities. Captain J. M. Christy, M.R.C.V.S., tells me that he has observed a marbled condition of the lungs, closely resembling that of contagious pleuro-pneumonia in cattle.

TREATMENT.—The only treatment which I have found at all beneficial, is careful nursing and change of air, for instance, to a deck above the one on which the animal became affected, or from the leaward to the windward side. The only way to be successful in this attempt, is to begin the treatment at the onset of the disease. If constipation be present, back-raking, an enema and a dose of Epsom salts might be tried. As a stimulant, spirits (a quarter of a pint of whisky in a pint of water) or carbonate of ammonia (2 drachms in a ball) will often be useful.

Congestion of the Lungs

is usually caused by over-exertion; by chill after prolonged, hard

work; and by defective ventilation in the stable. The fact of an animal being out of condition greatly increases his liability to congestion of the lungs from exertion. The distress is due to the lungs having become gorged with more blood than they can purify and return back to the heart. Death, in this disease, occurs from suffocation. More or less congestion always precedes inflammation of the lungs, and is, then, a transitory condition, and not a distinct disease in itself.

Congestion of the lungs from exertion occurs either directly or indirectly. We may have the direct form when a gross hunter has been ridden to a "stand-still" by an ignorant or brutal rider. Not unfrequently hunters exhibit the indirect form after (say, a couple of hours or more) they have returned, seemingly all right, to their stable. Other horses, under similar conditions of work, are, of course, as apt to get an attack as hunters. The first symptom of the indirect form usually noticed is that the animal begins, without any apparent cause, to "blow"—that is, to breathe quickly with distended nostrils. It appears, in these cases, that the sudden cessation of active exercise causes a large amount of blood to leave the blood-vessels of the limbs, and, consequently, produces more or less congestion in the vessels of the internal organs, which are liable to injury on this account proportionately to the extent they have been weakened by continued exertion or other causes. It is evident that the adoption of healthy means by which the rapidity of this return of blood can be checked, will act as a valuable preventive to this disease. We should also bear in mind that the more the system has been depleted of water, the less able will the blood be to circulate through its vessels. Hence, the liability to indirect congestion of the lungs will be proportionate, chiefly, to the unfitness of the animal; the duration and severity of the work; the length of time the animal has been deprived of water; the heated condition of the body at the time when the animal is stabled; the chilling influences to which the surface of the body is exposed after work, in or out of the stable; and want of ventilation and existence of draughts in the stable. The good effect of a drink of water in facilitating the circulation, especially of the surface of the body, when the system is in a heated state from severe exertion, and has been for a long time deprived of water, is well shown in our own cases, under similar circumstances, by the relief of oppression on heart and lungs, and by the skin becoming moist from perspiration. Whether our drink be tea, coffee, beer, shandy-gaff, or whisky and soda, the chief benefit will be derived from the water contained in it. A small amount of alcohol will act as a stimulant to the superficial circulation. Giving a hunter, while he is out, a small drink of water

from time to time, as may be convenient, will act very beneficially in safeguarding him from the ill effects of a long and trying day. During his journey home, the pace should be so regulated between walking and slow trotting, that he will return to his stable perfectly cool, and with the circulation of his blood thoroughly equalised throughout his body. If this cannot be done, the groom should walk him about, after the horse has come back, until a similar effect has been obtained. When he is taken into his stable, friction, by means of hand-rubbing or a whisp, should be freely applied to his skin, and he should be warmly clothed, warm bandages being put on if necessary; but the legs should not be washed. The ventilation should be perfect, but without any draughts. Indirect congestion of the lungs is most common among unfit hunters which have to return to their stables by rail, as is usually the case with those animals whose owners live in large towns during the hunting season.

SYMPTOMS.—The animal uses every effort to breathe. He stands with his fore legs wide apart, his head stretched out, his nostrils dilated, and he breathes with great rapidity; while his wild look, heaving flanks, bloodshot eyes, and trembling and sweating body denote the utmost distress. His legs and ears are cold. The lining membrane of his eyelids and nostrils is of a more or less purple colour, on account of its vessels being filled with non-oxidised blood, which the lungs have been unable to purify. The veins over the surface of the body appear swollen. It often happens that some of the congested vessels of the air passages give way, and there is bleeding of the nose. The pulse is extremely weak, though frequent; and the artery feels very full. After a time, the animal becomes more or less insensible, from the action of the impure blood on the nerve centres.

"Cases of pulmonary congestion occurring in connection with other diseases, although the symptoms exhibited are seemingly less severe, are more generally fatal than when appearing as the result of over-exertion" *(Robertson).*

Congestion of the lungs is frequently followed by inflammation of the lungs.

POST-MORTEM APPEARANCES.—The lungs are swollen, dark-coloured and soft, and their substance is easily broken: appearances which might lead an inexperienced person to imagine that these organs were rotten, and that the disease was of long standing, when, in fact, the condition may have become developed in a very short time.

TREATMENT.—If the disease is due to over-exertion in the

open air, the rider should dismount, slacken the girths, take the horse under some shelter, turn him head to wind, cover him over with any clothing procurable, give him a quarter of a pint of spirits (such as whisky or brandy) in a pint of water, supply him with water to drink, and rub him briskly over, so as to draw the blood to the surface of his body and away from his lungs. The spirits and water may be repeated after a quarter of an hour or twenty minutes. Two ounces of sweet spirits of nitre, or an ounce of tincture of arnica, may be used instead of the whisky or brandy. If possible, place the legs in warm water, and use warm fomentations to the sides. If the nature of the pulse indicates high arterial pressure (p. 356), we may bleed. Before deciding on bleeding, we should however remember that to be efficacious, it must be performed early, and that it is safest to employ it only in those cases of congestion of the lungs which are brought on by violent exertion.

In cases of indirect congestion of the lungs, blister as directed on p. 359, and use other means of relief as the symptoms may indicate. The same may be said of cases arising from causes unconnected with exertion.

During convalescence give laxative food, with $\frac{1}{2}$ oz. of nitre mixed in it daily for about a week.

Alcohol in small and repeated doses tends to relieve congestion of the lungs by quickening the general circulation, and also by stimulating the action of the skin. In large doses, it is extremely hurtful in this disease; as it would then diminish the number of pulsations of the heart, as well as the rate of breathing. Despite the disrepute into which arnica has fallen, I am inclined to think that when given internally, it is useful in stimulating the horse's skin to act.

Sore Throat (*Inflammation of the Larynx and Pharynx*).

Sore throat usually consists in inflammation of the mucous membrane which lines the larynx and pharynx. When the disease is confined to the former part, it is characterised by difficulty in breathing; when to the latter, by difficulty in swallowing. As simple inflammation of the pharynx (pharyngitis) is, as a rule, a mild disease which does not require any special treatment, the following remarks are made particularly with reference to the far graver one of laryngitis.

SYMPTOMS.—The discharge of phlegm from the mucous membrane of the larynx, as well as the inflamed condition of the part, more or less closes up that passage, and occasions distress in

breathing, "the inspiration being particularly prolonged, and attended by a peculiar harsh sound, succeeded by a short expiratory movement" *(Williams).* This sound can be heard on applying the ear to the part. There is swelling of the throat under the jaws, and tenderness on pressure at this point. There is a strong, hoarse cough, the strength of which indicates that the expulsion of air from the lungs is made with ease; and the fact of the horse shaking his head from pain, after coughing, shows that its performance hurts him by reason of the air passing over the inflamed membrane. The cough at first comes on in paroxysms, which are readily induced by excitement, irritation, or movement. Breathing hurried. Lining membrane of the nostrils and eyelids red, and filled with blood. Nose poked out. Anxious and distressed expression of face. Eyes prominent. Considerable difficulty in swallowing; food and water being often returned through the nostrils. Discharge from the nose, and flow of tears from the eyes. The larynx is always more or less painful to the touch. In bad cases, cold sweats break out over the body. "The pulse, which may at first be hard and full, soon becomes rapid and indistinct, fulness generally remaining; the visible mucous membranes now assume a livid appearance from non-oxidation of blood; prostration of strength becomes extreme; the animal staggers, finally falls, and dies after a few struggles" *(Williams).*

Although in simple pharyngitis there is great difficulty in swallowing, and thick saliva is continually discharged from the mouth, the patient suffers but little from constitutional disturbance.

PRINCIPLES OF TREATMENT.—In this disease, the vessels that lie underneath the mucous membrane become distended with blood, which pours out a portion of its watery fluid into the substance of the mucous membrane, causing it to become soft and enlarged, and to discharge from its surface quantities of phlegm (mucus). These three conditions—congestion of the underlying blood-vessels, distension of the mucous membrane, and the presence of phlegm—cause distress in breathing, and more or less danger of suffocation by reason of the blocking up of the windpipe at this part. Hence, the rational treatment is: (1) to relieve the congestion of the blood-vessels; and (2) to facilitate the expulsion of phlegm. With the latter object in view, we cause the animal to inhale steam, either plain, or from water in which oil of turpentine or eucalyptus oil has been mixed. With the former, we stimulate the skin underneath the throat, hand-rub the legs, and clothe warmly, so as to draw the blood away from the inflamed part. We give belladonna to relieve the congestion of the blood-vessels so as to check the escape, into the tissues, of watery fluid from the blood. We prescribe nitre in order to stimulate the kidneys to remove waste matters from the system along with the urine, and to maintain the fluidity of the blood, which nitre and certain other salts seem to have the power of doing, so as to facilitate the passage of the blood from the seat of inflammation. And, acting according to similar principles, we supply the animal with green meat and laxative food, not forgetting to support his vital powers after the virulence of the attack has somewhat abated.

A blister may also act well by drawing away blood from the part, and by, later on, causing the breaking up and absorption of any deposits which may be left as a result of the inflammation. A course of iodide of potassium will tend to diminish the risk of roaring being a result of the attack; for this medicine hastens the removal of inflammatory deposits which might press upon those nerves of the larynx that become affected in roaring.

PRACTICAL TREATMENT.—Allow the horse a plentiful supply of fresh air. Clothe warmly. Hand-rub the legs, and rub into them the following stimulating liniment:—

Soap liniment	$\frac{1}{2}$ pint.
Strong liquid ammonia	1 drachm.

and apply flannel or straw bandages.

Make the horse inhale steam from boiling water, which may be mixed with turpentine, provided that it does not distress him. Foment the throat, and, after that is done, apply the above liniment. If the case be at all serious, blister the throat with tincture of cantharides. Give a drachm of the extract of belladonna twice a day; place it between the horse's teeth, instead of giving it as a ball, which would irritate the throat; or give the electuary of belladonna and camphor as prescribed on p. 370; and give $\frac{1}{2}$ oz. nitre daily, dissolved in the water or mixed in the food. Allow gruel, linseed tea, and linseed and barn mashes, and substitute freshly-cut grass for hay. When the attack has subsided, the horse's strength can be kept up by gruel, and milk with eggs beaten up in it. Drenches and balls should not be used, as they would irritate the throat.

After an attack, it is perhaps the safest plan to blister the skin with biniodide of mercury ointment (1 to 8 of lard), under the seat of the disease, three or four times in succession, and to put the horse on a course of iodide of potassium—two drachms twice a day in the water—for a fortnight or three weeks.

In severe cases, tracheotomy is often the only means of saving the patient's life.

Acute Nasal Catarrh (*Cold in the Head*)

is inflammation of the mucous membrane which lines the nostrils and air passages of the head. It is generally caused by exposure to cold and wet, aided by change of temperature. It appears to be capable of being propagated by infection.

SYMPTOMS.—Catarrh is often ushered in by sneezing. At first the mucous membrane which lines the nostrils and eyelids is red and dry. This condition is soon followed by a watery discharge from these parts. In a few days the discharge becomes yellow,

thick, and copious, especially from the nostrils, like what we ourselves experience in the later stages of a cold in the head. There is more or less fever, dulness, and a roughness of coat, with or without shivering fits. Cough is usually present, and may continue for some time after the other symptoms have subsided. Catarrh, generally, runs its course in about a fortnight, although it may induce a prolonged state of bad health in the animal.

TREATMENT.—Put the horse on bran and linseed mashes, and give freshly-cut grass or lucerne. Allow a constant supply of drinking water, and give in it three-quarters of an ounce of nitre daily. Have the stable well ventilated, though free from draughts; and keep the animal comfortably clothed. Make him, from time to time, inhale steam, either plain or mixed with turpentine, in order to facilitate the discharge from the nostrils. If the cough is troublesome and the breathing difficult, blister the throat with tincture of cantharides. If a milder effect be required, stimulate the part with equal parts of ammonia, turpentine and oil. Two drachms of camphor and a drachm of belladonna, made up into a soft mass with a little linseed meal and treacle, may be given every day; a little at a time being placed between the animal's back teeth, for him to gradually swallow. If the bowels be constipated, administer an enema of warm water, and give, for a day or two, about a pint of linseed oil mixed up in, and divided between his mashes.

If, subsequently, there be great debility, the horse may have a couple of quarts of beer a day, and a drachm of sulphate of iron mixed, daily, in his food.

Cough

is a symptom of various diseases, which, instead of the cough, should be specially treated.

I have alluded, under the respective headings, to the chief kinds of coughs that are, respectively, characteristic of certain complaints, such as bronchitis, sore throat, pleurisy, broken wind, and roaring; so need here discuss only the condition which is popularly called "cough," on account of its exciting cause not being usually apparent to persons uninstructed in veterinary medicine. These coughs may be roughly divided as follows:—

1. TEETHING COUGH.—Though teething is generally alleged to be a common cause of cough, I have never met with any practical proof of this statement, and consequently can speak only from hearsay. This cough is said to be due to irritation caused by teething, independently of chill, and that it can be distinguished by the

fact that it is more violent in the morning than during other portions of the day, and by its being continuous. It is described as being of a "dry" character. Knowledge of the animal's age, and examination of his mouth, to see if his gums are in an inflamed condition, may aid us in determining its nature. Four-year olds are said to be often affected in this manner. The treatment should consist in giving the horse soft food for a few days with half a pint of linseed oil mixed in it every day. Half an ounce of nitre may be dissolved in the drinking water daily.

2. COUGH DUE TO CHILL.—I am inclined to regard the condition shown by this cough as a mild form of laryngitis. Some horses, from a naturally irritable state of their air-passages, are very apt to develop a cough on trifling provocation. Although serious chest affections are often passed over as "merely cough," we should remember that cough can be caused by an irritable condition of the air-passages, without the occurrence of actual, or, at least, marked inflammation. The treatment, in such cases, should consist in warm clothing, avoidance of cold and wet, and feeding on green meat, and on bran and linseed mashes, with half an ounce of nitre daily in the water for a few days. No corn should be given. In India, four or five pounds of young bamboo leaves may be supplied daily with advantage. If these simple remedies be not effectual, give, morning and evening, the camphor and belladonna electuary (p. 370); and stimulate the throat with equal parts of ammonia, turpentine, and oil. As cough often appears to be infectious, the animal should be removed away from his fellows, especially if they are valuable.

Racehorses are sometimes liable to get coughs, if, after exercise, the hollow space between the branches of the lower jaw be not promptly and carefully dried. The practice of making horses wear "night caps" (short hoods) tends, I think, to render them liable to coughs.

3. SYMPATHETIC COUGHS are generally caused by indigestion or worms, for which the animal should be specially treated.

4. CHRONIC COUGH often appears as a result of sore throat, influenza, or acute bronchitis, or as an accompaniment of chronic bronchitis, which, excepting the cough, and perhaps a slight running from the nose, may present no other symptoms of ill-health to the casual observer. This cough is hard, dry, ringing, and somewhat distressing. It is easily excited by exercise. A horse which suffers from chronic bronchitis is always more or less "short-winded."

TREATMENT.—Give green food, and bran and linseed mashes. Carrots "are beneficial in all chronic cases of the organs connected with breathing, and have a marked influence upon chronic cough and broken wind" (Stewart's "Stable Economy"). Blister the throat with biniodide of mercury, and if the camphor and belladonna electuary (p. 370) does not give relief, try a course of iodide of potassium as recommended for sore throat (p. 369). Referring to arsenic, Finlay Dun remarks: "I find it useful amongst horses in relieving chronic irritable cough, especially when remaining after attacks of influenza and sore throat. In such cases, with an ounce of Fowler's solution (liquor arsenicalis) is advantageously united an ounce of potassium chlorate, and a drachm of belladonna extract, made into a draught with water or gruel."

As an "all-round" cough mixture, we may give three or four times a day the following drench:—

Chlorodyne	2 drachms.
Dilute hydrocyanic acid	$\frac{1}{2}$ "
Water	$\frac{1}{4}$ pint.

LEGAL ASPECT OF COUGH.—As a "cough" invariably diminishes the natural usefulness of a horse at the time, it must in all cases be regarded as an unsoundness (*Coates v. Stephens*. Moody & Robinson's Reports, vol. 2, p. 158). It is also liable to be followed by permanent impairment of the animal's "wind." A cough is not a disease in itself, but is a symptom of the existence of some irritation to the air-passages, or to the nerves which supply them. If the irritation is of such a temporary character, as to be entirely removed then and there by the act of coughing, as for instance, in the case of a particle of dust going "the wrong way," this act of coughing should be regarded as the performance of a natural function, and not as an unsoundness. But if the irritation remains to an extent sufficient to cause the animal to cough more or less continuously, such a horse would be unsound; the persistence of the irritation being the cause of the unsoundness. Although the irritation, as in teething, may be a symptom of a healthy and natural process, it is not the less, on that account, detrimental to the animal's usefulness.

Bleeding from the Nose.

The only form of bleeding from the nose which I shall here consider is that which occurs suddenly during work in the otherwise healthy horse. It is generally induced by the severe exertion of galloping, and may be copious or may consist only of a few drops. If it is not frothy, we may conclude that it does not proceed from

the lungs. It may be caused by fulness of blood to the head, or by a diseased or weak condition of the blood-vessels of the mucous membrane of the air-passages of the head, as, for instance, in the case of a nævus (p. 162) of that surface. Horses appear to be more liable to this accident when they are pulling hard, than when they are allowed to go freely. The only treatment which I can advise, and which I have successfully employed in two or three cases, is the injection up the nostril, of water of a temperature of about 120° to 125° F. (p. 65). I can suggest no preventive. The advisability of putting the animal on laxative food, and gradually bringing him on to work again is self-evident.

Nasal Gleet (*Ozæna*).

DEFINITION.—A chronic and stinking discharge from the nose, due to local causes. It is a symptom of disease. If we use the term "ozæna" (from ὄζη, a bad smell) as a synonym for nasal gleet, we must regard a foul odour as a necessary condition of the discharge. We cannot put under this heading any somewhat similar discharge arising from a general disease, as, for instance, glanders.

In the discharge of ozæna, there has been found two kinds of bacteria, namely, the *bacillus fœtidus ozænæ* of Hajek, and the *bacillus smaragdinus fœtidus* of Reiman, both of which produce a very offensive smell. The question whether or not these organisms cause the disease has not yet been answered.

ANATOMY.—Under ordinary conditions, a horse breathes through his nostrils, which are separated from each other by a cartilaginous partition. In order to give a large surface for the attachment of muscles without greatly adding to the weight, some of the bones of the horse's face are hollowed out, so as to form, on each side, five cavities (or sinuses); the three principal, which are the only ones that need our attention here, being: the frontal, the superior maxillary, and the inferior maxillary sinus. The sinuses on one side are divided from those on the other side by a bony partition which runs down the centre of the face from a little above the level of the eyes, and which may be regarded as a continuation of the partition between the two nostrils. There is a common passage by which all the sinuses open into the nose; and there is a passage between the frontal sinus and the superior maxillary sinus. Under ordinary circumstances, the inferior maxillary sinus does not communicate with any of the other sinuses. The sinuses of the head are "blind" cavities, through which, practically speaking, there is no passage of air. The volume of air, however, appears to be changed by a slight alteration of tension during breathing.

The frontal sinus, on each side, lies underneath the bone of the forehead, between the eye and the middle line of the face. It extends about three inches above and about the same distance below a line joining the centres of the two eyes and drawn across the forehead.

The superior maxillary sinus, which is the largest, extends below the eye, supposing the head to be held in a vertical position.

The inferior maxillary sinus is usually separated by a bony partition from the superior maxillary sinus, below which it extends not lower down than the end of the zygomatic ridge.

NATURE AND SYMPTOMS.—As explained by Hamilton, the commonest cause of ozæna is a nasal catarrh in which the discharge has a tendency to dry in the air-passages of the head in the form of hard crusts, which emit the characteristic odour. In the large majority of cases, the discharge comes from only one nostril; that, usually, being, for reasons unknown to me, the left one. As regards treatment, it is important to recognise the fact that the diseased condition of which nasal gleet is a symptom, may be confined to the mucous membrane which lines the air-passages of the head, or may also extend to that of the sinuses. The discharge, under ordinary circumstances, will at first resemble that of acute nasal catarrh (p. 369), at which stage we cannot apply to it the name of nasal gleet. In time, the inflammation will lead to ulceration of the invaded mucous membrane, with the formation of pus, which may more or less block up the passages that drain the sinuses into the nose; thus causing irregularity in the amount of the discharge. As pus dissolves the tissues with which it comes in contact (p. 15), its retention in the sinuses will be followed by more or less destruction of their walls. Hence it may happen that the bones which cover an abscess thus formed in a sinus of the head, may become eaten away, and the affected part of the face altered in appearance from the bulging out of the abscess. The products from this diseased action, especially when bone is implicated and when the discharge has been retained for some time, will have a fœtid smell. The gleet may be more or less mixed with blood. The pus may become dried and caked in the sinuses.

As the discharge of glanders often resembles that of nasal gleet, it is always well, in all cases of chronic discharge from the nose, to satisfy ourselves of the absence or presence of the former disease, by means of mallein (p. 614).

In the history of a supposed cold in the head which degenerates into nasal gleet, we may observe that there is a watery discharge from the nose and perhaps a flow of tears from the eyes. As time goes on, the discharge from the nose assumes a pale straw colour, decreases in amount, and increases in consistency, until it becomes more or less like pus. Or the discharge may appear as if it were a mixture of two fluids; the one watery, the other made up of *débris* and particles of pus, which block up the passages into the sinuses from time to time, and are again blown out, often with some force, when the animal coughs, snorts, or breathes hurriedly from severe exertion. In purchasing a horse with an alleged cold in the head, it is most important to find out whether the affection is merely temporary, or whether it is nasal gleet. Here, a special warranty is the best protection; for, under ordinary circumstances, the examining veterinary surgeon will not be able to

gallop or otherwise severely try the animal's wind. Even if he does so, he cannot get beyond the fact that the horse is unsound in its organs of breathing; temporarily or permanently he cannot say, unless roaring (p. 380) is present. An examination of the state of the glands between the angles of the lower jaw, will not help him much, because they may be more swollen in ordinary cold in the head than in nasal gleet. As a great rule, however, the discharge of the former issues from both nostrils, although it may come more from one than the other; but that of the latter is almost always confined to one, namely, the left, as I have already observed. In catarrh, the discharge is rarely offensive in odour, and the eyes, which are not necessarily implicated in nasal gleet, are generally more or less inflamed. In the former disease, the mucous membrane of the nostrils will be red; but in the latter, it will often be of a leaden or yellowish hue indicative of general weakness.

Having satisfied ourselves that glanders is not present, we should search for pus in the sinuses (beginning with the superior maxillary sinus as the most likely one) by boring into them with an ordinary gimlet, on withdrawing which, if pus be present, some of it will be found in the groove of the instrument. In case of doubt, this operation should not be neglected; for it is generally conclusive and is easy to perform. Before exploring with the gimlet, we might test for the presence of pus by tapping the part from the outside with the finger. If it emits an abnormally dull sound—a fact which we may test by repeating the percussion on the other side—we shall have reason to think that our suspicions are confirmed. This method, however, does not always give reliable results.

CAUSES.—Although the causes of many cases of nasal gleet are obscure, I think we may number among them: injury to the bones of the face, as might occur from a blow or fall; cold in the head; and diseased teeth. With respect to cold in the head, we can easily see that if the inflammation of the mucous membrane of the air-passages of the head, extends to that of the sinuses; the diseased discharge may be retained in these cavities, owing to the small size of the passages which drain them into the nose, in which case, a collection of pus would be the probable consequence. As regards diseased teeth, we should bear in mind that the fangs of the fourth, fifth, and sixth molars penetrate into the superior maxillary sinus; and, consequently, disease in them might, not unlikely, set up inflammation in the mucous membrane of that sinus. Also, the fourth molar is more liable to decay than any of the others. It is thought by some authorities that the entrance of foreign bodies, such as particles of food, into the sinuses, may give rise to nasal gleet. Against this supposition, Colin tells us, in his "Physiologie Comparée," that experiments on the living animal prove that the tension of the air in the sinuses of the head is increased during expiration, and is diminished

during inspiration. Consequently the horse has no tendency to draw into these sinuses any particles which may be contained in the air that he takes into his lungs. Macqueen has demonstrated the impossibility of introducing powdered material into the sinuses by blowing it up the nostrils even with considerable force. He also found that the sinuses of the heads of two coal-pit ponies which had worked for years in an atmosphere more or less charged with mineral dust, were, after the animals had been killed, free from the slightest trace of coal dust. These experiments, besides proving that it is highly improbable that nasal gleet can be caused by the entrance into the sinuses of irritating particles from without, show the futility of trying to relieve nasal gleet which proceeds from the sinuses, by blowing or injecting medicinal agents up the nostrils.

Old age appears to be a predisposing cause of nasal gleet, which hardly ever affects young horses, except from injury.

Formerly, reported cases of nasal gleet were far more common than at present, because, apparently in those times, glanders was much more frequent and much less understood than it is now. Consequently, many cases which should have been put down as glanders, were regarded as those of nasal gleet.

TREATMENT.—Our treatment should be varied according as the inflammation is confined to the nose, or has extended to one or more of the sinuses. In the former case, we may use, say, twice a day, injections up the diseased nostril, or nostrils, of some suitable astringent, as ¼ oz. sulphate of zinc, 1 oz. creolin, or 20 grains of chinosol (p. 67) to the pint of tepid (say, 98° F.) water. Or perhaps, better still, we may blow into the nostrils burnt alum by means of an insufflator, which is an instrument made for the purpose of blowing medicines in the form of fine powder, into parts they could not otherwise reach. It sometimes happens that the horse will violently resist his nostrils being blown into or injected, in which case, we may be obliged to put on a twitch, blindfold him, and tie up a fore leg. If pus be in the sinuses, we should trephine, and syringe out the cavities, say, twice a day, with one of the solutions just mentioned; having, in the first instance, copiously syringed them out with tepid water. We may also have to break up dried collections of pus in the sinuses with some convenient instrument, such as a whalebone probe. If the partition dividing the inferior from the superior maxillary sinus has not been opened by the operation of boring a hole through the cheek bone, it should be subsequently broken through, so as to secure efficient drainage. If the passage between the inferior maxillary sinus and the nose be blocked up, we may, if necessary, bore, into

the inferior maxillary sinus, another hole, lower down on the cheek and clear the passage by means of syringing and the use of a probe. To keep the holes in the bone from closing up, we may fit into them respectively, after syringing the cavities out, champagne corks; those used for the holes in either of the maxillary sinuses, having a passage bored down their centre with a rat-tailed file, for purposes of drainage. When we find that the secretion of the mucous membrane is healthy, which under ordinary circumstances it will be in a fortnight or three weeks, we should take out the corks and allow the wounds to heal up. If we find that the cause of the nasal gleet is the presence of the diseased fang of a tooth which projects into one of the maxillary sinuses, we should remove the offending tooth, which is an operation I need not describe here. It is well to feed the patient off the ground, for the lower the head is held, the more efficient will be the drainage. Probably, much of the good obtained in this disease from turning the horse out to grass, is due to the head being kept longer in a dependent position than if the animal was in the stable.

Broken Wind (*Emphysema of the Lungs*).

The term "broken wind" denotes a chronic condition of difficulty of breathing in which the act of expiration is always longer than that of inspiration.

The difficulty of breathing in broken wind is almost always due to emphysema of the lungs, which consists of a dilated condition of the lungs, owing to an excess of air in the air-cells or in the cellular tissue that surrounds the lobules (p. 351). This continued dilatation prevents the lungs from becoming exhausted of air, at the end of the act of expiration, to their full extent, which causes the amount of air taken in to be less than it would be, were the lungs capable of being properly emptied. In any case, a certain amount (residual air) always remains in the lungs. When the distension occurs in the air-cells—in which case, by the breaking down of their walls, the cells of the affected lobule tend to run into each other—the chief cause seems to be violent expiratory efforts made in the act of coughing. In the case, however, of distension existing in the connective tissue (inter-lobular emphysema), the entrance of air appears to occur during inspiration; the primary cause being, probably, some slow and long-continued degenerative change in the lung tissue. As a full condition of the stomach and intestines greatly interferes with the action of the lungs, it is not surprising that violent work, when the animal is "blown out" with food, and especially when his "condition" is not good, should be followed by emphysema of the lungs.

Owing, probably, to improved stable management, broken wind is now a rare disease.

SYMPTOMS.—When breathing, while the animal is at rest, air is taken into the lungs in a more or less normal manner, but is expelled from them by two distinct efforts, the muscles of the abdomen forcibly aiding the completion of the act of expiration,

as is made apparent by the heaving of the flanks; the ribs being comparatively little used for breathing by a broken-winded horse. We may note that, when a healthy animal is at rest, there is only one effort made in expelling air from the lungs; for tranquil and natural expiration is a passive act of elastic recoil. From exercise, the difficulty of breathing increases out of all proportion to the amount and nature of the work, and the duration of the act of expiration is longer than that of inspiration; the contrary of this being the case in health. At the commencement of the attack there is a spasmodic cough, which is more or less intermittent. Later on, it becomes a single weak, short, and suppressed cough, as if the animal had not power in his chest to give a full one, and is often accompanied by expulsion of wind from the anus, which is more or less protruded. The difficulty of breathing (except at first, when there are remissions) is constant, and increases in proportion to the amount of food in the stomach and intestines. The digestion and general health of animals affected are usually much out of order. Broken wind may come on suddenly.

CAUSES.—This disease appears to be generally brought on by putting the animal to hard work when his stomach and intestines are distended with food, or when he is suffering from diseases of the organs of breathing; or by neglect of such diseases. The consumption of unsuitable food (such as chopped straw, hard and innutritious hay, and over-ripe rye-grass), which is often regarded as the exciting cause, has, in all probability, only a predisposing influence, which is a remark that is undoubtedly true with respect to roaring (p. 380). Writing about New Zealand, where this disease is not uncommon among horses which are kept in the open, Mr. J. A. Gilruth, M.R.C.V.S., Chief Veterinary Officer and Bacteriologist for New Zealand, remarks ("Fifth Report of the Department of Agriculture," N.Z., 1897): "No one, as far as I am aware, has produced the desired condition experimentally by feeding. . . . In all cases there was some history of a cold which never seemed to leave or become entirely absent, and as no rational attempt was ever made to treat these cases when suffering from the cold, or even to house them, it is no wonder that permanent lesions, such as pulmonary emphysema, resulted."

The predisposing influence of heredity is said to be well marked in this disease. Some authorities assert that broken-winded mares are almost always barren.

TREATMENT.—As broken wind is incurable, the treatment can only be palliative. Feed and water by small quantities at a time. Give carrots. Substitute freshly-cut grass and lucerne for dry hay. Bruise the corn and damp it, or, better still, mix through it, say,

a pound of boiled linseed, or a quarter of a pint of linseed oil. Attend to the horse's general health and to the proper ventilation of the stable. Keep him short of food and water before being worked; though, when doing continuous work for some hours, small quantities of gruel or water, given occasionally, are of benefit. Total deprivation of water at such times, is almost as bad as giving it in excess.

An ounce of liquor arsenicalis, increased up to two ounces, given daily in the food for a fortnight, might be tried. A pound of lard or butter, which may be given in balls, acts in abating the distress for a few hours. Horse copers sometimes endeavour to pass off a broken-winded animal as sound, by giving him, a short time before examination, a number of balls of fat, or a quantity of shot, which acts as a sedative.

M. G. Geudens ("Annales de Méd. Vétér.") states that he cured two horses of broken wind by giving them every morning and evening for about two months, $\frac{1}{2}$ grain of strychnine arseniate, 4 grains of arseniate of iron, and 30 grains of iodide of potassium in a pint of ale.

Damp forage is recommended in this complaint. Trasbot, referring to palliative measures, remarks: "We will only cite damped hay, green food, and, above all, forage wet with molasses and water. This last regimen, employed often in the north of France, has given very satisfactory results."

Broken wind is a grave unsoundness.

Asthma.

This very rare equine disease is a chronic condition which is characterised by paroxysms of distressed breathing that come on at more or less regular periods.

With our present state of knowledge, we cannot say whether or not the causes of asthma are the same in all cases. The two most probable theories are those of spasm, and of engorgement. By the former, the paroxysms are supposed to be caused by the spasmodic and more or less continued contraction of the muscles that surround the small air-tubes, which condition interferes with the act of breathing, by closing, to a greater or less extent, these air-passages. The contraction of these muscles appears to take place during inspiration. The muscles which surround the small air-tubes may become so developed from continued exercise, that they may cause a permanent narrowing of the calibre of these passages. Owing to the action of the irritated nerves, the circulation in the lungs will become impeded, and we may have a certain amount of dropsy in these organs, on account of the increased exudation of watery fluid which escapes from the congested blood-vessels. From difficulty of expiration during the paroxysms, emphysema of the lungs is a probable result of asthma. By the second theory (that of Clark), the difficulty of breathing is accounted for, on the supposition that, owing to some sedative influence on the vaso-motor nerves which supply the bronchial tubes, engorgement of the blood-vessels of their mucous membrane takes

place, with more or less blocking up of the bronchial tubes. I may explain that the vaso-motor nerves are the nerves which, on becoming stimulated, cause contraction of the muscular coat of the blood-vessels. Whichever theory we accept, we must, I think, regard asthma as a nervous disease which is seldom if ever brought on by catarrh.

The chief CAUSES of asthma are probably: bronchitis, foul air in stables, and the breathing of air containing irritating vapours or irritating particles.

In order to warrant the decision that a case of difficulty of breathing is due to asthma, we must prove the existence of these paroxysms, independently of any external exciting cause, such as work, and after more or less regular intervals of ease, during which the breathing is normal, to a greater or less extent. The fact that the breathing in asthma, though difficult, is not hurried, and that it is slower in expiration than in inspiration, serves to distinguish this disease from bronchitis and pneumonia. Also, in uncomplicated asthma there is little or no running from the nose, except, perhaps, at the end of a paroxysm.

TREATMENT.—One of the best medicines in this disease is chloral hydrate, which may be given by the mouth in a dose of 3 drachms dissolved in a pint of water. If there be difficulty in this, we may inject hypodermically (p. 633), 5 grains of morphia, or $1\frac{1}{2}$ drachm of chloral hydrate; or we might inject into the rectum an ounce of chloral hydrate dissolved in a quart of water. The precautions as to food and sanitation recommended for broken wind (p. 378) may be observed in cases of asthma.

Asthma is a very serious unsoundness.

Roaring.

DEFINITION.—Roaring is a symptom of disease or malformation which gives rise to noisy and more or less distressed breathing.

VARIETIES.—The chief varieties of roaring are as follows:—

1. *The paralytic form*, which is the cause of about 95 per cent. of cases of roaring.

2. *Roaring from mechanical obstruction in the air passages.*

3. *Roaring from mechanical alteration of the shape of the air passages.*

4. *Roaring from poison.*

Any of these varieties may be either chronic or temporary.

When the noise of roaring is shrill, it is sometimes termed *whistling*.

NATURE AND CAUSES OF THE PARALYTIC FORM OF ROARING.—This disease is due to paralysis of one or both of the

muscles which open the larynx, and which are called the *crico-arytenoidei postici*. On account of this muscular inability, the larynx cannot be opened to its full extent for the entrance of air into the lungs during inspiration, and consequently the noise is heard, and the distress in breathing is experienced, during that period. Dupuy tells us that the opening for the admission of air into the larynx is reduced to about two-fifths of its normal width in bad cases of roaring, in which both sides are affected. As a rule, only the muscle of the left side becomes paralysed.

In all cases, *this paralysis is caused by interference with the nervous supply of the laryngeal muscles*, which, failing to be stimulated by their nerves, gradually wither away from disuse. Experiments by Gallien, Legallois, Dupuy, and others show that division of the nerve in healthy horses immediately causes paralysis of the laryngeal muscles of that side, and consequently makes the animal a roarer. In roarers, the interference in question is generally caused by pressure on the affected nerve by tumours, swollen glands, etc., which are usually due to diseases of the organs of breathing. The greater liability of the left nerve (the left recurrent branch of the pneumogastric) to become affected than its fellow, seems to be due to the fact that while passing, in its course, from the vicinity of the heart to the larynx, it closely approaches the bronchial and tracheal lymphatic glands, which, in the event of their becoming swollen, would exert injurious pressure on it. We may judge from our own experience, how easily the glands of the throat become swollen from cold, etc. The right nerve does not go near the glands of its side of the neck. Gunther, Franck, Martin, Sussdorf, and other veterinary authorities maintain that this atrophy is caused by the pressure of the aorta (the large artery of general circulation which issues from the left ventricle of the heart) on the left recurrent nerve during great exertion, and consequent violent action of the heart, on account of its proximity to the aorta, round the arch of which it winds: the right nerve is not placed in this manner. In support of this theory, the fact is put forward that a "roaring" respiration is a frequent symptom, in men, of aneurism of the arch of the aorta, round which the left recurrent laryngeal nerve winds, as in the horse. Consequently, when the artery becomes distended by the aneurism, it presses on the nerve. Against this argument, we have the unanswerable fact that roaring is dependent on climate and not on the action of the heart or aortic pressure. For instance, horses bred in India, South Africa, and other warm climates, even from "noisy" parents, are worked, trained, and raced as hard as anywhere else, and yet roaring is practically unknown among them. Size cannot account for this immunity; for many of them are big horses. From this we may also infer that aneurism of the aorta

is not the usual cause of roaring in horses. "According to Goubaux, the left recurrent is situated more superficially than the right in the lower part of the neck, and for this reason is more exposed to compression. He thus explains why, in chronic roaring, the alterations observed are nearly always in the left muscle of the larynx" (*Chauveau*).

The wasting (atrophy) of a muscle from loss of nervous supply consists in its gradual conversion into white fibrous tissue, which is the hard inelastic substance we see in a tendon or ligament. As fibrous tissue can never become reconverted into muscle, a cure for the paralytic form of roaring is possible only before this structural change has taken place, namely, in the first stages of the complaint.

Cadéac records a case of roaring produced by a melanotic tumour (p. 128), which was on the upper third of the right side of the neck, and which pressed on the right recurrent nerve. Glechner mentions an instance of roaring due to pressure by a thrombus (p. 118) in the jugular vein. An injury to a recurrent laryngeal nerve from external violence has been known to produce roaring. Cadéac points out that pressure of the collar in draught cannot injuriously affect these nerves.

This paralysis arises on rare occasions from poisoning, which will be discussed later on (p. 387).

As causes of paralytic roaring, we may include all diseases, such as strangles, which are liable to give rise to tumours that might set up this paralysis. The great immunity from roaring which horses of hot climates possess (p. 383), shows that the usual causes of this disease are unable to act without the aid of one or more predisposing influences, except on very rare occasions.

Improper food, generally of a dry and hard nature, appears to be a cause of roaring. As the nerve affected in roaring is a branch of the great nerve (the pneumogastric) which, in the performance of one of its functions, influences the movements of the gullet and stomach, it is reasonable to infer that the larynx will participate more or less in the ill-health of these organs. It is probable that the fact of the left recurrent nerve extending farther back into the chest than its fellow, is one of the causes of its being more readily affected by indigestion than the right recurrent. In Syria, Egypt, and other parts of the East, horses are fed for about ten months of the year on barley straw or wheaten straw, and a little barley; and during that time they do not as a rule get any green food. The straw which they receive is, however, quite soft, because it has been bruised and broken up, during the native process of thrashing. These animals (as I have remarked when discussing the question of heredity)

hardly ever become roarers. On the other hand, I have known instances, in Egypt and India, of horses becoming roarers when liberally fed on ordinary chopped straw, the ends of which would probably have an irritating effect on the mucous membrane of the mouth, gullet and stomach. The animals in question were either English horses or Australian horses which were descended from English parents, and were therefore more or less predisposed to this complaint. As I could find no cases of roaring produced in this manner among Egyptian, East Indian, and Arab horses which were fed under similar conditions, I conclude that this manner of feeding can produce the disease only in conjunction with a predisposing influence, such as that of heredity. Many experienced stablemen in England consider that hay given in large quantities is a well-marked cause of roaring, especially if it contains a considerable proportion of rye grass, which is rich in woody fibre. The proportion of woody fibre in hay is much higher if the grass is cut late, than if it is harvested early in the season, say, in the beginning of June; and also varies according to the amount of fermentation that takes place during the process of drying. Heavy cart-horses in Scotland and in the North of England, many of which are given large quantities of straw to eat, are almost as subject to roaring as are thorough-breds. Here, the fact that they are of great size (p. 385) has a strong predisposing influence.

Experience justifies the remark that, other conditions being equal, horses which are fed on green grass are not so liable to roaring as those which are kept on hay or straw, especially if it is chopped. It is instructive to note that if straw is chopped so fine as to allow it to be readily swallowed without being well masticated, it is much more liable to cause indigestion than if it is cut at a length of, say, four or five inches.

PREDISPOSING CAUSES OF ROARING PARALYSIS.—1. *A cold, damp climate* is undoubtedly the chief predisposing cause in this disease, evidently by its influence in producing diseases of the organs of breathing. In fact, the liability to contract roaring in a country, other conditions being equal, is directly proportionate to the tendency of horses in that climate to catch colds and coughs. No country, however, is absolutely free from this disease, which is common in the cold, damp climate of Great Britain and Ireland, but is almost unknown in the warm climates of India, Egypt, Syria, Arabia, Persia, South Africa, and, I believe, in South America. During an eighteen years' residence in India, I found only two or three cases of roaring among the many thousands of Arab horses I met, and about the same number in Indian-bred horses. It is true that the majority of Arabs are under 14.2; but many of the Indian

country-breds, especially stud-breds, were over 15.2. I have known two or three instances of roarers which were imported from Australia into India become perfectly sound in their wind, after a residence of a year or two in that hot country; a fact which shows the strong influence of climate in this disease. It is evident that such a recovery is possible only during the early stages of roaring, before any marked structural change has taken place in the affected part (the larynx). Roaring affects about 5 per cent. of all the horses in England. In Australia, probably not 1 per cent. of the horses are wrong in their wind. In the United States, the percentage is less than in this country.

Although the fact of Ormonde being a roarer, was the apparent cause of his not being retained in this country as a sire, M. Ed. Nocard ("Receuil Vétér.") tells us that none of the stock which he sired in Argentina went wrong in their wind.

My experience in the interior of Russia convinces me that damp greatly increases the predisposing influence which a cold climate has on roaring. It has no effect in this respect, in the case of hot climates. The same remark applies to the influence of climate in producing coughs and colds.

2. *Heredity*, especially in the dam, has a very strong predisposing influence in cold, damp climates, but an extremely weak one in hot countries. I found in India and South Africa that the fact of a dam or sire being "musical," was practically no detriment to his breeding value. The only positive case of hereditary predisposition in roaring which I met with in India, was a thorough-bred two-year-old colt whose dam, an Australian, was a roarer. On putting him into work, I noticed that he made a noise, but he became perfectly sound in his wind before he was three years old.

The only proof we have of heredity being a cause of roaring is furnished by some authorities who aver that they have met with cases in which the left recurrent nerve was absent at birth. Such instances are so rare, and have been so imperfectly authenticated, that we may regard a predisposing influence as the only part played by heredity in the production of roaring.

Breed, as a factor in roaring, comes under the heading of heredity. Of all races of horses, the English thorough-bred is most liable to acquire the paralytic form of roaring, a predisposition which is more or less inherited by its descendants. The chief reason for this characteristic liability is that this breed has suffered during a long succession of years from causes best calculated to establish a strong hereditary predisposition, namely: residence in a cold, damp climate; living, in many instances, in heated and ill-ventilated stables; being constantly fed on dry, hard food; and being habi-

tuated to perform labour demanding extreme exertion of the organs of breathing.

3. *Size of horse.*—The paralytic form of roaring is, essentially, a disease of large horses. Although ponies are as liable to become broken-winded as are big animals, they very seldom contract this form of roaring. We find among horses which are own brothers and sisters, and which have an hereditary taint, that the bigger the individual animal, the more predisposed it is to roar. The only explanation which I can offer of this fact, is that the smaller the horse, the quicker is the circulation of blood, and, consequently, the readier will be removed from the system any diseased products formed during an attack of catarrh, strangles, etc., which might become absorbed into the lymphatic glands of the neck, and thus give rise to injurious pressure on the left recurrent nerve. No breed of pony, as far as I know, possesses absolute immunity from roaring, which I have observed in English, Australian, Arab, East Indian, and Chinese ponies.

4. *Stable arrangements that are calculated to induce coughs and colds;* such as those which obstruct ventilation and give rise to draughts of cold and damp air. While living in St. Petersburg a few years ago, I saw very strong evidence of this influence among fashionable Russian carriage-horses, which were kept in hot, ill-ventilated stables, and consequently many of them suffered from roaring. The common horses, which had a full supply of fresh air, even when the thermometer went down to—30° F., were practically free from this disease.

5. *Violent exertion of the organs of breathing.*—It goes without saying that the more any organ is over-taxed, the more liable will it be to become diseased.

6. *Insufficient exercise of the muscles of the throat.*—Mr. Henry Goodall, M.R.C.V.S., observed to me that as the horse is constituted to spend a large portion of his time with his head close to the ground when feeding, during which period the muscles of his head and neck are in almost constant exercise; the practice of tying up stabled horses and feeding them from raised mangers, must injuriously affect the muscles which open the larynx by diminishing their blood-supply. A dependent position of the head and the fact of the surrounding muscles being in play, would naturally increase the blood-supply of the part. In India and South Africa, horses are, however, tied up and fed from raised mangers the same as in England.

PERIOD OF INCUBATION IN PARALYTIC ROARING.—Dieckerhoff considers that the period of incubation is not less than a month. He has arrived at this conclusion, from careful observa-

tion and from the fact that when roaring occurs, as it not infrequently does, after contagious pleuro-pneumonia, it does not become apparent for at least a month after the attack. This is a useful point to remember in questions of soundness.

SYMPTOMS OF PARALYTIC ROARING.—The sound is harsh and occurs during inspiration. It is not very unlike that caused by the sawing of wood when heard at a distance. Some observers say that the noise may, also, but to a much less extent, be noticed during expiration. In mild cases, the objectionable sound is, usually, not apparent, unless the animal is put to a fast pace. At the commencement of the affection, it is often heard only at the beginning of exercise, and wears off as the work is continued. If it is worse at the end of a gallop than at starting, the horse may be regarded as a confirmed roarer. Some horses roar so badly, that they "make a noise" when only walking, and even when standing still, without having been exercised.

The roarer often has a deep, or "churchyard" cough, which is characteristic of the malady.

A horse which has been bred in a country where roaring is common, and which grunts, whether when suddenly startled, or when jumping, should be looked upon with great suspicion as to his being a roarer; for if such a habit of grunting is not an actual proof of roaring, it points to a strong tendency to that complaint, in the great majority of cases, or to some marked defect in the organs of breathing. Here, we should of course take into consideration the country in which the animal has been bred, and the cause of the grunting. A horse which is perfectly sound in his wind and has not the slightest tendency to become a roarer, may grunt, when for instance he lands over a fence, if he be infirm in front. I can offer no explanation of the connection between grunting and roaring; but accept the fact from practical experience. Also, I confess that I can detect no difference between the grunting of roaring, and the grunting of pain.

"Grunting" is the term applied to the abnormal noise made by some horses, when suddenly startled or when suddenly moved or checked (as when landing over a jump) during movement.

As a great rule, a roarer gets gradually worse with age.

Some horses which are not roarers, are apt to make a noise when pulling hard at their bridle, on account of opening their mouth and drawing back their tongue, by doing which they force back the soft palate, so that it partly blocks up the air passage between the nasal cavities and the larynx.

My experience is that roaring seldom affects a horse before two

years old and very rarely attacks him, in the first instance, after he is seven.

ROARING FROM MECHANICAL OBSTRUCTION IN THE AIR PASSAGES.—As a result of laryngitis, bronchitis and other diseases, the interior of the air passages may become rough, diminished in size, or altered in structure. We may thus have thickening and even ossification of the arytenoid cartilages (which form the front part of the roof of the larynx), and swelling of the mucous membrane, with roaring as a result. This form of roaring may also be caused by the presence of tumours which obstruct the opening of the larynx. Such tumours sometimes cause intermittent roaring.

ROARING FROM MECHANICAL ALTERATION OF THE SHAPE OF THE AIR PASSAGES.—I have seen this form of roaring caused by an attack of osteoporosis (p. 260) which distorted the shape of the nasal cavities. It may be due to irregular or imperfect union of the edges of the wound made into the windpipe by an operation for tracheotomy. The continued use of a very tight bearing rein is said to have occasionally caused roaring, by distortion of the larynx.

ROARING FROM POISON.—Several Continental writers have described cases of roaring (probably of the paralytic form) which were caused by the eating of certain poisonous plants, and which were complicated as a rule by other disorders. The chief plants in question are: The ordinary lentil (*ervum lens*), bitter lentil (*ervum ervilia*), corn cockle (*agrostemma githago*), and the vetchlings (*lathyrus cicera* and *lathyrus sativus*) (p. 588). Cadéac tells us that in *lathyrus cicera*, these substances are chiefly oxalic acid and saponin. Oxalic acid is a strong poison which acts on the nerve centres and on the heart, and is found in sorrel and other plants. Saponin contains sapotoxin, which is a dangerous blood poison and breaks up the blood corpuscles (Whitla). We read in Ann Pratt's "Flowering Plants," that saponin occurs in soapwort (*saponaria*), Nottingham catchfly (*silene nutans*), wild lynchis (*lynchis diurna*), and chiefly in plants belonging to the order of Caryophylleæ (pinks, chick-weeds and carpet-weeds). The poisonous nature of many wild and garden plants is due to the presence of saponin.

TESTING A HORSE'S "WIND."—If the horse is a saddle animal, he should be sent a strong gallop on soft ground, so as to "open his pipes" and to allow the examiner, who, if possible, ought to be in the saddle, to observe the nature of his breathing. If the examination be conducted on foot, the horse,

after passing near to the examiner, say, a couple of times, should be pulled up sharply, and brought to him, to enable him to apply his ear close to the animal's nostrils, so that he may detect any peculiarity in the breathing, while the horse is "blowing hard." Any roughness of sound during inspiration should be sufficient to at once condemn the horse. I advise riding the animal, because we can note the nature of the respiration much more accurately when riding him than when listening to his breathing as he passes us on foot. Dieckerhoff observes that when testing a horse's wind, it is well to gallop him (in small circles to the left for choice) with his head held high and turned to the left, and his chin drawn in; for in that position the animal will be more likely to manifest his infirmity than in any other way. He remarks that it is impossible to make a sound horse emit the characteristic noise of roaring by holding his head in any particular position. On this account and by reason of the fact that recurrent laryngeal paralysis is a progressive disease; we should make every practical effort to prove that the horse is incapable of emitting the objectionable sound, the slightest sign of which should be regarded as a proof of unsoundness; and, if he is a saddle horse, we should not rest content without giving him a strong and fairly long gallop, if possible, through heavy ground, or up an ascent. A similar procedure may be adopted with a harness-horse, which should, if practicable, be driven on soft ground, so that we may hear the noise if it be present. When testing the wind of a heavy cart-horse, we should make him fully exert his powers by moving a big load. If this be not available, we can use a drag, or improvise one by locking the hind wheels of the cart by means of a stout pole passed between the spokes.

When we are unable to put the horse to severe exertion, in order to facilitate our task of observing the nature of his breathing, we may "grunt" him by catching him short by the head with one hand, and suddenly threatening to strike him under the belly with a stick or whip; when, if he is a roarer, he will, in the large majority of cases, grunt. This effect is best produced when the animal, before being threatened, is placed (so that he may not wheel round) alongside a wall, the portion of which reserved for this purpose, at dealers' yards, is sometimes covered with a sheet of india-rubber, so that the horse may not hurt himself by knocking up against the wall. Roarers as a rule are difficult to "cough" by pressing their larynx with the fingers. Hence, after proving that a horse does not grunt, if we find that he coughs readily and in a healthy manner, when we squeeze his larynx between the finger and thumb, we may be fairly confident that his wind is all right. We should bear in mind that "coughing" is not always a reliable

test. Owners of valuable horses, as a rule, strongly object to their horses being "coughed," because the repeated performance of this test, especially if it is roughly done, is apt to injure the larynx. When sending up a hunter for sale to any of the public horse marts, such as Tattersall's, or that of Warner, Sheppard and Wade, it is much better, supposing that the animal's powers of breathing are all right, to state that the horse is sound in wind, and to forbid his being tested for it, than to subject him to the annoyance and ill effects of being grunted and coughed by every passing idler.

"We are able to recognise the wasting of the muscles by feeling the larynx of the roarer with the fingers; for the left arytenoid allows itself to be pushed back more easily and more deeply down than its fellow. This procedure sometimes sets up roaring while the animal is at rest" (*Friedberger and Fröhner*).

ROARERS AS STUD ANIMALS.—Owing to the strong influence of hereditary predisposition in this complaint, a mare or stallion that is affected by roaring, should on no account be used for stud purposes in Great Britain, or in any other country in which the climate is at all favourable to its development. I have already pointed out that there is no objection to breeding from roarers in countries like India, South Africa, and South America, the respective climates of which are antagonistic to its propagation. Fleming states that the hereditary influence of a roaring stallion in conferring this disease on his offspring usually increases with age.

TREATMENT.—Acting on Mr. Harry Goodall's idea of the bad effect which the continued practice of feeding horses from raised mangers has on the muscles of the neck, and taking into consideration the remarks I have already made on the influence of food in the production of this disease; I would advise that on the first symptoms of roaring being perceived, the animal, supposing that he was otherwise in good health, should be turned out to graze during the day; or be given grass or other green meat instead of hay and chaff, and be fed on a level with the ground and not from a raised manger. He should be kept warm by clothing, and should have the freest possible ventilation in his stall. "I have no doubt that roarers might be improved a stone if they were trained from an open shed, sheltered from wet and rain, keeping them warmly clothed and always in the open air" (*Admiral Rous*). I have seen good results from giving a roarer a daily allowance of linseed, say, one pound, or 4 oz. of linseed oil. The linseed may be in the form of linseed meal mixed through the food, of linseed tea, or of linseed mash.

The only medical treatment which appears to be of any benefit

is the administration of iodide of potassium ($\frac{1}{2}$ oz. a day in the food or water). It is useful only in the early stages of this malady; because it is powerless to restore lost muscular tissue. Friedberger and Fröhner recommend a course of hypodermic injections, near the larynx, of about a grain of strychnine once a day for three days at a time, with an interval of one day. Electricity might be tried; although, if I remember rightly, Dr. Fleming used it on Ormonde, without success.

I have never seen any good results from the practice of giving racehorses which are roarers, just before starting for a race, butter or oil, as some persons recommend, with the object of lessening their infirmity of breathing. Such animals will often make much less noise when "fit," than when "out of condition."

To modify the admission of air into the lungs, Reeve has suggested the use of a strap to pass over the false nostrils of a roarer. This strap is fixed to each side of the bit, and is kept in position by a strap at each side attached to the head-stall of the bridle. "To the inner surface of this strap, immediately over the false nostril at each side, was fixed a body resembling in shape the half of an hen's egg cut longitudinally. When applied, these bodies pressed upon the triangular space formed by the apex of the nasal bones and upper jaw, thus closing the false nostrils, and partly diminishing the channel of the true ones." The employment of this strap has been ruled to be cruelty to animals. Mr. Reginald Over points out to me that as the cessation of the objectionable noise is thus obtained only by decrease in the amount of inhaled air, the action of the strap in no way relieves the difficulty of breathing, which is caused by the calibre of the larynx being abnormally small. He also tells me that if a roarer is making a "noise" after severe exertion, the "music" can be instantly stopped by applying the fingers to one or both nostrils, so as to partly diminish the supply of air taken into the lungs.

Any benefit which might be obtained by exporting a roarer from a cold damp climate, into a hot, dry one, would be possible only during the early stages of the complaint; that is, before the affected muscle or muscles had become converted more or less into fibrous tissue. The chances of recovery by change of climate are far too few to warrant the adoption of such a remedy.

Tracheotomy is a useful means of relief from roaring, especially with racehorses.

Up to the present, the attempted relief of roaring by surgical means has been a failure. We must remember that the mere removal of the noise or of the obstruction can have no curative effect on the nervous disease which rise to it, and which, also, frequently affects the lungs and general health in an injurious manner.

LEGAL ASPECT OF ROARING AND GRUNTING.—" In practice, roaring is always very properly considered an unsoundness" (Oliphant's "Law of Horses"). We may assume, without the slightest fear of contradiction, that the disease or alteration of structure, of which the noise is a sign, injuriously affects the animal's powers of breathing, and that it consequently impairs his usefulness.

Bassett v. Collis ("Campbell's Reports of Cases at Nisi Prius," Vol. 2, p. 523).—"Lord Ellenborough.—It has been held by very high authority (Sir James Mansfield, C.J.), that roaring is not necessarily unsoundness; and I entirely concur in that opinion. If the horse emits a loud noise, which is offensive to the ear, merely from a bad habit which he has contracted, or from any cause which does not interfere with his general health or muscular powers, he is still to be considered a sound horse. On the other hand, if the roaring proceeds from any disease or organic infirmity which renders him incapable of performing the usual functions of a horse, then it does constitute unsoundness." The distinction made by His Lordship, is of no importance; for roaring or whistling is not due to any bad habit; but in all cases proceeds from a disease or organic infirmity which interferes with the animal's muscular powers, and frequently with his general health.

Onslow v. Eames ("Starkie's Reports of Cases at Nisi Prius," Vol. 2, p. 81).—"Lord Ellenborough.—If a horse be affected by a malady which renders him less serviceable for a permanency, I have no doubt that it is an unsoundness. I do not go by the noise, but by the disorder."

Thomas v. Young ("Veterinarian," for 1877, p. 668).—In this case, roaring was held to be an unsoundness, and the jury immediately found for the plaintiff, who had, on a warranty of soundness, bought a horse which he, subsequently, found out was a roarer.

In Vallance v. Brook (Windsor County Court, Dec., 1850), the Judge, in summing up, stated that, "roaring was an unsoundness in law."

The legal aspect of grunting has given rise to much discussion. As far as I can see, the simple fact of a horse being a grunter in no way proves that he is unsound; for up to the present it has not been demonstrated that grunting is necessarily caused by disease, alteration of structure or malformation. Although it is true that the large majority of grunters are more liable to become roarers than non-grunters, we can no more consider a grunter unsound on that account, than we could condemn as unsound an apparently perfectly healthy horse, because one of his parents was a roarer. If such an extension of liability to

disease were allowed, we should have, to be consistent, to reject all big horses as unsound; because they are more apt to become roarers than small horses! If a grunter stands the test of galloping or drawing a heavy load, he should be passed.

Thick Wind.

This term signifies an impaired condition of the horse's powers of breathing, unaccompanied by noise, or by any peculiarity during inspiration or expiration. When put to fast work, or to violent exertion, his breathing becomes more accelerated, and he himself more distressed than ought to be the case were his respiratory organs in a healthy state (taking into consideration his working "condition"), and his flanks continue to heave for a comparatively long time after he has ceased labour. This state is, usually, the result of thickening of the bronchial tubes, owing to a previous attack of bronchitis, and is often accompanied by chronic cough. Palliative treatment, similar to that recommended for broken wind and roaring, might be tried.

Highblowing

is not a disease, but is produced simply by the flapping of the horse's nostrils when he expels air quickly from his lungs. The larger, thinner, and more delicate the nostrils are, the easier will it be for the horse to make this noise, which appears to be under his control. It is rarely heard, except at the canter or half-speed gallop, and seldom when the animal is exerting himself to the utmost. I am inclined to consider it a sign of good wind. One can imitate the sound, near enough to understand how it is made, by bringing the lips of one's mouth lightly together, and then blowing moderately strong through them. If one blows hard, the vibrating noise is not made. I have mentioned this subject of highblowing, because it is sometimes mistaken for roaring by inexperienced people.

CHAPTER XIX.

Internal Parasites.

GENERAL REMARKS—SKETCH OF THE ANATOMY OF THE ORGANS OF DIGESTION—LEECHES—BOTS—TAPE WORMS—WORMS.

General Remarks.

The "General Remarks on Parasites" made on p. 130 *et seq.*, apply equally well to the subjects of this chapter. It would have been more correct though less convenient when writing in popular language, for me to have put at the head of this chapter, "Non-microbic Internal Parasites." Parasites may be divided into those which are microbes (microscopic organisms), and those which we may see with the naked eye, or with a magnifying glass of low power. In the present chapter, I shall write solely about the latter, and shall reserve for Chapter XXII. any remarks I may have to make about the former with reference to their capacity as producers of infective diseases. Diseases producing microbes belong, as a rule, to the vegetable kingdom.

The parasites which I shall consider in this chapter are those of the more common kinds that invade the internal organs of the horse.

Sketch of the Anatomy of the Organs of Digestion.

THE DIGESTIVE APPARATUS of the horse, like that of man, consists of the alimentary canal, in which the food is digested; and various organs which promote the digestion and transit of the contained food.

THE ALIMENTARY CANAL is formed of the mouth, pharynx, gullet, stomach, small intestine, and large intestine.

THE MOUTH consists of the lips, cheeks, tongue, hard palate, soft palate, and the surfaces in which the teeth are implanted (dental arches). The lips help to take up solid and liquid food, and to retain it and also saliva in the mouth. The cheeks, conjointly with the tongue, place the food between the back teeth, to be ground up. The tongue also plays a large part in swallowing. The

hard palate forms the roof of the mouth, and the soft palate is the membranous curtain which divides the mouth from the pharynx. The incisor (front) teeth are used for seizing and cutting the food, when, as in the case of growing grass, it offers resistance to its introduction into the mouth. The molar (back) teeth are grinders. As the lower jaw is much narrower than the upper jaw, the horse can chew his food only on one side of his mouth at a time.

The PHARYNX (p. 350) is a cavity common to the alimentary canal and the air passages.

THE GULLET (œsophagus) is the tube which carries food from the pharynx to the stomach. In the first half of its course down the neck, it lies above the windpipe, and then becomes inclined to the left of it.

The STOMACH of the horse is comparatively small, as it can hold on an average, only from 3 to $3\frac{1}{2}$ gallons.

THE SMALL INTESTINE is the continuation of the alimentary canal from the stomach. It is about 72 feet long, $1\frac{1}{2}$ inches in diameter, is doubled many times on itself, and it leads into a large sac, called the *cæcum*, which is the animal's chief water reservoir, and which is capable of containing on an average about $7\frac{1}{2}$ gallons of fluid.

THE LARGE INTESTINE is made up of the cæcum, large colon, and the small colon. The large or *double colon* is a wide canal which begins at the cæcum and ends at the commencement of the small colon. It consists of a succession of dilatations and contractions, and occupies the position of a loop doubled on itself. It is generally about 12 feet through its entire length. It is capable of containing about 18 gallons, and it communicates with the small or *floating colon*, which is about 10 feet long, and is folded several times on itself, in a manner somewhat similar to that of the small intestine. The posterior end of the small colon (the *rectum*) takes a straight course from the front of the pelvis to the anus.

STRUCTURE OF THE STOMACH AND INTESTINES.—These organs are composed of a mucous membrane, which lines their interior; a muscular coat, which covers this mucous layer; and a serous coat, which is the smooth and glistening membrane we see on the outside of the stomach and intestines of the dead body of an animal whose abdomen has been opened.

GLANDS WHICH DISCHARGE FLUIDS INTO THE ALIMENTARY CANAL.—The salivary glands are situated in various positions near the mouth, into which they pour their respective secretions (saliva). The largest of them is the parotid gland, which is behind the lower jaw, and close to the ear. The most important salivary glands exist in pairs, one on each side of the head. The right side of the stomach is largely supplied with small glands which pour gastric juice into that organ. The surface of the left side of the stomach is similar to that of the gullet. A duct carries bile from the liver and discharges it into the small intestine. The pancreas (sweetbread) pours its secretion (pancreatic juice) into the small intestine, principally through this duct. There is a vast number of small glands which line the small and large intestine, and pour their respective secretions into them.

DIGESTION may be briefly described as the process which dissolves food and renders it capable of being taken up (absorbed) by the system. In order to attain this end, the alimentary canal has to convey the food in a gradual manner from front to rear. Thus, while the food is being ground by the back teeth, it becomes saturated with saliva, which assists the act of swallowing, and helps to dissolve sugar and starch. When it arrives in the stomach, the gastric juice aids in dissolving the nitrogenous matter (albumin, etc.) con-

tained in it; and the muscular coat of the stomach churns up the food and gradually pushes it into the small intestine, where it meets the bile and pancreatic juice, which more or less complete the work of digestion. The worm-like action of the muscular coat of the intestines forces the food backwards, during which course, its digested portion becomes more or less completely absorbed, until the residue enters the rectum in the form of dung, and is finally expelled.

Leeches (*Hæmopis*).

The leeches which suck the blood of horses, may be divided into land leeches and water leeches. The former attach themselves to the skin of the legs and adjacent parts of horses which travel through their haunts; and are consequently external parasites. The latter (the horse-leech or *hæmopis sanguisuga*, and other kinds) not being able to penetrate the skin, attach themselves to the mucous membrane, and, in this endeavour, enter the mouth or nostrils of the horse when he is drinking or grazing in wet and leech-infested pasture. They sometimes cling to the mucous membrane of the eye. According to Neumann, the horse-leech, which lives in water, generally gains access to the mouth and nostrils, when young and when not more than about a tenth of an inch in length. They usually restrict their wanderings to the air and food passages which are in front of the respective openings of the windpipe (larynx) and gullet. Their more or less numerous presence (over a hundred may be found in one horse) causes loss of appetite, debility, wasting, and even death by loss of blood or by obstruction to the breathing. Besides these symptoms, their existence inside the horse may be guessed at or ascertained by the animal bleeding at the nose, by the foam of the mouth being mixed with blood, and by the parasites being seen on an examination of the nostrils and mouth being made.

Water leeches are found in various countries, and in great abundance in Algiers.

TREATMENT consists in removing the parasites, in sustaining the strength by suitable food and tonics, and by performing tracheotomy in the event of the leeches seriously interfering with the breathing. Probably, the best way to dislodge them is to wet them with a strong solution of salt and water, on being touched with which they will loose their hold of the mucous membrane and drop off. We may apply the salt and water to those which are out of reach of the hand by means of a piece of sponge firmly fixed to the end of a sufficiently stiff rubber tube or other flexible stem; by drenching; or by pouring the fluid down each of the nostrils. The horse might be "coughed" (p. 291) now and then, so that he may expel the parasites by the act of coughing. In the use of a

sponge in the manner just mentioned, care should be taken that there is no chance of the sponge coming off the stem to which it is fixed. An excellent plan for the removal of these internal leeches is to keep the horse without water for about twenty-four hours, to water him from a bucket after that period, and to pick off the leeches which come down to drink the water, or to return to the water whence they came. The fact of the horse being deprived of water for a comparatively long time, appears to render his blood somewhat distasteful to the leeches.

As PREVENTIVE MEANS in leech-infested countries, we may filter the water through cotton cloth, charcoal, or sand. Neumann remarks that eels and other kinds of fish will clear water of leeches by eating them up. The precaution of not allowing horses to drink at water in which leeches are known to reside, is obvious.

Bots (*Gastrophiles*)

are the larvæ of gadflies, which lay their eggs during the autumn (in England, principally during August) on the skin of horses. These eggs, on becoming hatched (in from 20 to 25 days, according to Joly; and from 4 to 5 days, according to Bracy-Clark), produce small worms, which irritate the skin by their movements and thus cause the horse to lick them off and take them into his mouth, with the result that they gain access to various parts of the alimentary canal. The bot having selected its place of residence, attaches itself by hooks to the mucous membrane, and derives its sustenance, during its stay, from the wound made by its hooks. In the summer, the larva, after living inside the horse for about ten months, quits its hold, and is expelled with the dung. Having concealed itself near the surface of the ground, it becomes changed into a chrysalis, from which the gadfly issues after an inactive existence of from thirty to forty days' duration (Neumann). The female fly becomes impregnated, lays her eggs on those parts of the horse from which they can be most easily licked off, and thus completes her cycle of existence. The changes undergone by the gadfly are similar to those of the butterfly, in which we have egg, caterpillar (or bot), chrysalis, and fly. These flies attack only in the open, and almost exclusively in fields. They are met with in far greater numbers when the season is hot and dry, than when it is cold and damp.

In New Zealand, bot-flies inflict great distress on horses, and are occasionally the cause of death to them.

The following are the more frequent kinds of bots:—

1. The most common form is produced from a gadfly (*gastrophilus*

equi) which lays light, orange-coloured eggs, about the twentieth of an inch in diameter, chiefly on the breast, front of the fore-arms, and those parts of the shoulders and sides that are in reach of the horse's tongue. The eggs are firmly attached to the ends of the hairs of the coat, by a sticky fluid secreted by the fly. The bots, which are about four-fifths of an inch in length, select for preference, as a residence, the left compartment of the stomach, in which they may be found in scores, and sometimes even in hundreds.

2. The *gastrophilus hæmorrhoidalis* lays its eggs on the muzzle of the horse, which it appears to frighten by its approach. The eggs are about the same size as those of the first variety, but are darker in colour, and the bots are smaller in size; being about five-eighths of an inch in length. Although the left compartment of the stomach is their usual place of first temporary residence, they may attach themselves to the mucous membrane of the passage between the mouth and the respective openings of the gullet and windpipe. They may also be met with in the right compartment of the stomach and in the small intestine close to the stomach. Having remained some months in their selected sites, they become detached, and on reaching the lower portion of the rectum, fix themselves for some time to the mucous membrane of that part. When in this position, they often become exposed to view, on the horse straining when dunging. They are then of a green colour.

3. *Gastrophilus nasalis* lays her eggs, which are white in colour, on the lips and nostrils of the horse. These bots are of a light yellow colour and locate themselves in the small intestine close to the stomach. When they are of full size, they are about three-fifths of an inch in length. Their presence in the intestine is apt to give rise to colic.

4. *Gastrophilus pecorum* is frequently to be found in Eastern Europe. Its eggs and bots closely resemble those of the *g. hæmorrhoidalis* in appearance and behaviour, except that its bots are red. They also attach themselves to the lower portion of the rectum before being finally expelled.

EFFECT OF BOTS ON THE HEALTH OF THE HORSE.—Although the fact of bots being inside a horse can be of no possible advantage to him; their presence, when in small numbers, is, as a rule, productive of little or no ill consequences to their host. If their number be large, they cannot help being a source of debility and irritation. In more or less exceptional cases, they cause, especially among young horses, indigestion, loss of condition, and even death. There have been cases of fatal interference with breathing due to bots of *g. hæmorrhoidalis* lodging about the larynx. These

bots and those of *g. pecorum* frequently cause a great deal of irritation and straining from their presence near the anus. It is indisputable that the wounds caused by bots, in the stomach and elsewhere, may have serious and even fatal consequences; although the perforations of the stomach which are not infrequently noticed in post-mortem examinations of horses that have been infested with bots, have, in the large majority of cases, been made by these larvæ after death.

PREVENTION.—The best means of prevention are keeping the horse away from pasture land during the season when the gadfly lays her eggs, and picking or clipping them off when they are seen on the skin. When found in large numbers on the coat, we may with advantage rub them over with a mixture of one part of paraffin oil and two parts of sweet oil, the effect of which will be destructive to the eggs, and deterrent to the female gadflies.

TREATMENT.—Generally speaking, bots in the stomach require no treatment; for they have as a rule but little hurtful effect on the horse; medicines do not appear to have much power in dislodging them; and they pass out at their appointed time. Although I have not tried the experiment, I am inclined to think that a course of tartar emetic, say, two drachms a day in the food for a fortnight, would have a marked influence in expelling these parasites. If bots are seen to be lodged in the rectum, they can be removed by the hand; the horse may be given an enema of 6 oz. of oil of turpentine and 3 pints of linseed oil; and the inside of the anus may be smeared round with a little mercurial ointment on the finger. If bots are lodged at the back of the mouth, they may be detached by brushing them over with eucalyptus oil, or a mixture of one part of oil of turpentine and three parts of sweet oil, applied by means of a mop made with a sponge or cotton cloth; or even by rubbing them off.

Perroncito has obtained excellent results in the removal of bots, in the case of yearlings and two-year-olds, by giving two gelatin capsules, each containing $\frac{3}{4}$ drachm of bisulphide of carbon, eight times a day, with intervals of two hours (total amount equal to 720 grains); and next morning, 150 grains of tartar emetic in the drinking water. The bisulphide of carbon, which has an effect somewhat similar to chloroform, though not so lasting, caused the animals to sway about a good deal during movement, and increased their secretion of saliva. On the third day, a large number of bots were passed in the dung, and the animals quickly recovered from the debility and loss of condition from which they had suffered. The bisulphide is a strong antiseptic, and an effective de-

stroyer of bacteria. Dr. Whitla remarks with reference to human practice that "recent reports from Chili state that 2 oz. doses of a saturated solution of the drug in water, when given with milk before meals, relieved dysentery, dyspepsia, typhoid fever, etc."

Tapeworms (*Tæniæ*)

have been found in the horse; but so rarely that we need not consider them here. Their presence more or less injuriously affects the animal's health.

Worms (*Nematodes*).

All the worms which are observed to come away from the horse, whether naturally or by the influence of medicine, should be thrown into a fire or into boiling water, so as to cut short their power of evil. The free use of common or rock salt renders the intestines of the horse a more or less unsuitable place of residence for these parasites. As the eggs and embryos of several kinds of the worms which infest the horse are to be found in water, especially when the water is stagnant; the best preventive measure is attention to the quality of the water consumed by the horse, whether as drinking water, or as water adhering to forage, such as grass, lucerne, roots, etc. The hotter the climate, the more does stagnant water, other things being equal, teem with forms of animal and vegetable life which, like the worms we are considering, are hurtful to the health of the horse. In India, the practice adopted by native grass-cutters, of soaking the grass, so as to add to its weight and to increase its apparent freshness, before giving it to horses, is the cause of many of these animals becoming infested with worms, on account of the water selected for damping the grass being in many cases stagnant, and consequently polluted.

The following are the chief kinds of worms found inside the horse:—

1. THE ROUND WORM (*ascaris megalocephala*) resembles an earth worm in shape. It is yellowish-white in colour, stiff and elastic. When full grown, it varies from 6 inches to 14 inches in length, and generally resides in the small intestine; although it sometimes invades the stomach, in which its presence usually causes great derangement of the horse's health. These parasites probably gain entrance into the animal's body in the water he drinks, or in the damp forage he eats. "The eggs which they lay, are never hatched in the intestine, but are expelled with the dung" (*Cagny and Gobert*). They often reside in the horse without giving any apparent trouble, in which case their numbers are probably small.

When a horse is largely infested by them, he falls away in condition, and his general health becomes more or less affected, which fact may be made evident by the morbid state of the appetite, rough coat, pot belly, liability to colic, and slight diarrhœa due to the irritating presence of these parasites. When worms infest a horse, some of them will generally come away with the dung from time to time. "These parasites are sometimes so numerous, that they block up the small intestine and give rise to colic, which may kill their host. They occasionally cause perforation of the bowel" (*Cagny and Gobert*).

Dr. L. Valentine describes the case of a tramway horse in Rome which contained in its stomach and intestines 1,142 specimens of the *ascaris megalocephala*, over a score of which had penetrated the intestinal into the peritoneal cavity, causing fatal peritonitis" ("Veterinarian," Feb., 1898).

The best *treatment* is removal of the cause, for which I have found that the most effective plan is to give ½ drachm each of tartar emetic and sulphate of iron in the food four times a day for a week, and then to administer a purgative in the form of a ball of aloes (p. 598) or a drench of a quart of linseed oil; keeping the animal during that period rather "short" on bran (dry or in mash) and hay or grass. Although this diet will weaken him for the time being, it will also affect the parasites, and will induce them the more readily to quit their abode. Tartar emetic, which has but a slightly depressing effect on the horse, even when given in very large doses, appears to have an extremely nauseating effect on the worms, which readily come away when subjected to its influence. Sulphate of iron, probably on account of its astringent qualities, clears the intestines of an excess of mucus, which forms a nest for the worms. In obstinate cases, a second course of tartar emetic and sulphate of iron, followed by a purgative, may be tried after an interval of a week. After this, the animal may get in his food, a drachm of sulphate of iron every day for a fortnight or three weeks.

Or we may give 3 ounces of turpentine in a quart of linseed oil. Turpentine causes death to the parasites on contact, which readily takes place owing to its being volatile. As turpentine has a strongly stimulating effect on the kidneys, the large dose of 3 ounces should not be repeated, if a second one be thought necessary, after a shorter interval than ten days. It should be given in oil, as it has a very irritating effect on the mucous membrane, when undiluted. Oil is also a worm destroyer, in that it clogs up the skin through which the worm breathes.

A suitable dose of tartar emetic for a well-bred foal nine or ten months old would be 10 grains three times a day, and continued for a week.

Mr. Peter Wilson, M.R.C.V.S. in "The Veterinarian," advises the use of thymol (p. 406) for the relief of this disease.

2. THE THREAD OR MAW WORM (*oxyuris curvula*) is about an inch and three-quarters in length, when of full size. Its tail end is thin and whip-like; its front end being thicker and terminating in a curve, somewhat in the form of the crook of a stick. The presence of these parasites produces little disturbance of the animal's general health; although it may cause irritation about the dock, which will be made manifest by the horse rubbing his tail. Accompanying these worms, a light yellow waxy substance (the eggs of the parasites) will be found adhering to the skin immediately below the anus. Thread worms, like round worms, frequently come away with the dung.

Treatment.—To clear out the rectum, back rake (p. 638), give an enema (p. 632) of warm water, and then administer another enema of six ounces of oil of turpentine in half a gallon of linseed oil. If, after a repetition or two of this treatment, the worms are still found in the horse, we may conclude that they are too far up in the intestine to be reached by an enema, and we may consequently treat the animal in the manner directed for round worms (see preceding page). Anointing the inside of the anus with a little mercurial ointment on the finger, will allay the itching and will hasten the removal of those worms which have taken up their abode near that part.

3. THE PALISADE WORM (*sclerostoma equinum*, or *strongulus armatus*) is a very common parasite in horses of most countries, although its presence in the animal usually remains unsuspected. The pastures on which it is found are generally poor and marshy. Its body, which is grey or brownish-red in colour, is more or less straight and stiff, and its front part is thicker than its hind extremity. It varies a good deal in length; the male, from $\frac{3}{4}$ inch to $1\frac{1}{2}$ inch, and the female, from eight-tenths of an inch to 2 inches. It is about twenty times as long as it is thick. It occurs in the horse in two forms, namely, in an adult and in an immature state (before it arrives at puberty). In the former, it implants itself on the mucous membrane of the cæcum and large colon, by means of its armed mouth; and in the latter, it resides chiefly in aneurisms, and in cysts underneath the mucous membrane of the cæcum and large colon, but is occasionally found in other organs, such as the brain, testicles and liver.

In the adult state, the large intestine is sometimes "studded with them. Chabert counted more than 1,000 on a surface of two inches, and he estimated the total in one horse at more than a million.

. . . They are frequently met with in couples; two individuals forming almost a right angle, and adhering so intimately that they may be preserved in this condition in alcohol" (*Neumann*). Their presence, when they are in considerable numbers, sometimes causes death by exhaustion and diarrhœa.

Palisade worms seem to gain entrance into the body of the horse, in the form of embryos, which the animal swallows in the water he drinks, and in the damp forage he eats. Having arrived at their intended place of residence, they penetrate through the mucous membrane of that part, underneath which each worm forms a tumour (or cyst), as a result of the products of the inflammation caused by their presence. These cysts or temporary nests, which may be seen or felt on the surface of the intestine when it is opened after death, vary in size from that of a pin's head to that of a hazel nut. The cysts and the presence of the worms in them do not appear to cause any serious disturbance to the animal's health. The immature worms in the cyst vary from $\frac{1}{25}$ of an inch to $\frac{1}{3}$ of an inch in length. After having passed through a stage of development in their respective cysts, the worms leave them; some going into the intestine, to attach themselves to its mucous membrane, to assume the adult form, and to produce eggs, which are expelled with the dung. These eggs are oval in shape, are about $\frac{1}{250}$ of an inch long, and about half as broad. They become hatched in water or damp dung in from three to eight days under a temperature of from 59° to 77° F. The embryos thus produced are about $\frac{1}{60}$ of an inch in length. They have a blunt head and a thread-like tail.

The *immature worms* which do not issue from the cysts directly into the intestine, get into arteries (chiefly those of the great mesenteric, which is the supplier of blood to all the intestines, with the exception of a portion of the rectum), and are then liable to set up inflammation in these vessels, with the result of a sac being formed by the dilatation of the wall of the artery. These sacs vary in size from that of a pea to that of a man's head. The wall of the sac becomes thickened, and the sac becomes more or less filled with a fibrous deposit formed by the inflammatory exudation and by clotted blood. There is a passage for the blood left in the fibrous deposit, which may extend for some distance over the internal surface of the artery, either towards the heart or away from it. The sac and its contents are called an *aneurism*; and the fibrous deposit, a *thrombus*. Immature, pink-coloured worms, of a half to one inch in length, and averaging about nine in number, are, as a general rule, found in the centre of the clot. Portions of the blood-clots formed by these aneurisms are apt to break off, and, on being carried along in the blood-current, to block up the

artery, in which case, the obstruction is called an *embolus*. Owing to obstructions thus formed, the part usually supplied by the artery becomes more or less paralysed, with the result, in the case of the intestines, that flatulent colic is produced, on account of fermentation taking place in the delayed food. On the formation of an embolus, there is an immediate attempt at the restoration of the circulation by side branches of the vessels. We then have a race between the "collateral circulation" and the colic, which will become cured if the function of the part becomes restored before the resulting pain or flatulence has produced fatal consequences, or before twist or invagination (pp. 420 and 421) of the bowel has taken place. These emboli may produce weakness or diminished freedom of action of the hind quarters.

After the immature worms have undergone another stage of development in their respective aneurisms, they again launch themselves into the blood stream, and by its means they reach the intestine, under the mucous membrane of which they again form cysts; become adult; and emerge into the intestine, to which they attach themselves and produce eggs.

As a rule, these aneurisms are not found in foals younger than three months old, and are more frequent in aged horses, than in young ones.

The dangers due to the presence of palisade worms in the arteries are: embolism, and rupture of the wall of the aneurism, in which case there will usually be fatal bleeding into the abdominal cavity, with rapid failure of the physical powers and bloodlessness of the mucous membranes.

Although these emboli give rise to no characteristic *symptoms*, we may suspect their presence when we find that the horse is liable to colic without any errors of diet being to blame, and when the seat of pain appears to be far back, as will be shown by the animal crouching behind and, if obliged to walk, getting his hind legs under him as much as possible. Often, when the animal seems on the point of death, with the surface of his body very cold, he will take a sudden change for the better, owing to the collateral circulation becoming established, and will rapidly mend. In the treatment of this form of worm colic, I would advise a drench of a pint of linseed oil, and 2 oz. of turpentine, followed, if necessary, by an ounce of chlorodyne in a pint of water, or half an ounce of the extract of Indian hemp. Besides the symptoms of colic caused by embolism, the presence of the worms in the intestines gives rise to more or less inflammation of the bowels, diarrhœa, generally, of a fœtid and sometimes bloody character, and slight attacks of colic. The diarrhœa, disturbance of the functions of digestion and circulation, and drain on the constitution by the presence of

these parasites in the intestines and blood-vessels, induce loss of condition, general debility, unthriftness of the coat, and sometimes a dropsical swelling under the belly. The treatment appropriate to the removal of these parasites from the intestines is similar to that for round worms (p. 400), namely, by tartar emetic and sulphate of iron, followed by a purgative, or we may try thymol (p. 406).

4. SCLEROSTOMA TETRACANTHUM *(Strongylus tetracanthus)* somewhat resembles the palisade worm in appearance. The fore part of its cylindrical body tapers towards the head, which is truncated (cut short off). The mouth is circular, and is provided with four prominent spines (or suckers); hence its name. The mouth has two other suckers (or papillæ), but they are comparatively short. This worm uses its suckers to attach itself to the mucous membrane of the intestine. It varies from a third to three-quarters of an inch in length, and is white; although it usually appears to be of a blood-red colour during life, by reason of the blood which is generally contained in it. Hence, it is often called "the red worm."

This parasite and the palisade worm are found more or less frequently all over the world. I learn from Veterinary-Surgeon Desmond that they are found in Australia, only on pastures which have been for a long time under cultivation; that lucerne paddocks give the greatest number of cases; and that these parasites have been imported into the Australasian colonies. The *s. tetracanthus* and *s. armatus* are almost always associated together in their attacks on horses.

Its favourite haunt is marshy land, like the Cambridgeshire fens, where it is a constant resident, according to Mr. H. C. Wilkie, F.R.C.V.S. ("Journal of Comp. Path." March, 1896). Mr. W. Shipley, jun., F.R.C.V.S., states:—"As far as my experience goes, I believe certain pastures are infested with these worms, and colts turned on them invariably get them. As a rule, they are low-lying, indifferent marshes. I have not, however, satisfied myself as to their existence on some old heavily-wooded parks and pastures, but I always look to old, poor marsh land. It is certain that marshes on which husk is known to be prevalent are also infested with these worms. I have clients who invariably lose a colt or more from these worms, while their neighbours never have a case" (The "Veterinarian," March, 1896). Husk is a form of bronchitis which frequently attacks sheep, and which is caused by the entrance into the windpipe of worms (strongyli) that are closely related to the palisade worm and the "red worm." It is therefore evident that ground which harbours the parasites of

husk, is likely to be favourable to the growth and development of palisade and red worms, and should therefore be avoided as pasture lands by horse-owners. The same remark applies to the parasites (flukes) which often give rise to disease of the liver in sheep.

Mr. Shipley tells us that "yearlings are more liable to be affected than adults; in fact it is seen only rarely in five-year-olds and upwards. Moreover, in adults the effects are nothing like so disastrous."

The *mode of attack* of the sclerostoma tetracanthum is practically similar to that of the palisade worm, except that, as far as we know, it does not get into the arteries. The embryos enter the horse's system by means of the water he drinks, or the damp forage he eats, and having arrived in the cæcum or large colon, they burrow through the mucous membrane of the intestine, and each of them forms a cyst, in which it coils itself. It then undergoes a stage of development, becomes mature, issues from its cyst, attaches itself to the mucous membrane of the intestine (cæcum or large colon), and breeds; the eggs being carried out in the dung. The worms do not come to puberty until they leave their cysts. If we open the cæcum or large colon of a dead horse which is infested with these parasites, and scrape the mucous membrane of that part, we shall see on its surface, small dark spots, which indicate the position of the cysts, and if we cut into one of them, we shall find in it a coiled-up worm, which may be an embryo, or an adult worm that is ready to quit its cyst and enter the intestine. The foregoing account of the migrations of these parasites coincides with that given by Neumann, Friedberger and Fröhner, Cadéac and other authorities; but some of the details of the subject have not yet been definitely settled.

"I have had cases of this form of helminthiasis brought under my notice as early as December, but as a rule I think they are more numerous during the months of January, February, and March. It would seem that about this time the larvæ, coiled up in the mucous membrane of the cæcum and large colon, are approaching maturity. They have increased much in size, and many of them are preparing to make a way through their epithelial covering, while some are already free in the lumen of the bowel and have reached their full development" *(Wilkie)*.

The principal *symptoms*, all of which are not necessarily present at the same time, are as follows:—Dropsical swellings of the lower surface of the belly, sheath and limbs; pale condition of the mucous membranes; watery and more or less inflamed state of the eyes; bad smelling diarrhœa; dulness; debility; emaciation; staring coat; and the presence of the worms in the dung. "When

recently discharged, they are the colour of arterial blood, but they dry up rapidly and the colour becomes darker, and they thus easily escape the notice of the casual observer. . . . The temperature is often sub-normal; appetite usually impaired, often capricious; and indigestion, with abdominal pains, is by no means an uncommon complication" *(Wilkie)*. Formerly the disease was often called pernicious anæmia or water farcy.

The gravity of the case depends chiefly on the youth of the animal and on the number of worms that are in him. As the adult parasites are blood-suckers, and as the immature ones cause irritation to the intestine while they are in their cysts, we can easily understand how death often occurs from exhaustion and diarrhœa, in which blood is sometimes found. It is probable that the disease is chronic, only when fresh relays of these worms are imported into the intestine from time to time; because the eggs are carried out along with the dung, and adult worms are frequently expelled in the same manner, in varying numbers. Hence, if the patient is removed from further infection, we may reasonably infer that the chance of his recovery will be far greater, than if his system remains exposed to the continued entrance of these parasites.

Treatment.—Recently, the good effects of thymol in this disease has been amply proved. It may be given daily in doses of from 10 to 15 grains for four or five days, followed by a drench of linseed oil, suitable in quantity to the age and size of the patient (p. 595). Thymol is most easily given in dry food. The best method for its administration is in a gelatine capsule, as a ball. It is insoluble in water, but the amount here prescribed would readily dissolve in a glass of whisky or other spirits, which could be mixed in a pint of milk. Dr. Whitla, writing about human practice, says that thymol "should never be given in solution, as it causes a burning sensation in the throat and mouth." Thymol can be repeated as may be required.

The strength should be kept up by liberal feeding, such as hens' eggs (from 6 to 12 daily) and corn; and about 4 oz. of common salt should be mixed through the food every day. In the case of an animal at grass, the corn should be supplied gradually, so that his digestive organs may become accustomed to it. Care should be taken that the water he gets is absolutely free from parasites.

5. FILARIÆ are thread-like worms, which, when full grown, are from, say, 2 to 6 inches in length. Their tails are more or less curled. They are usually found in serous sacs, such as the cavity of the abdomen, that of the chest, that of the pericardium (the sac which covers the heart), and the cavity which contains the

watery humour of the eye (p. 339). From the abdomen they sometimes descend into the sac which contains the testicles.

All of us who have lived in India must have observed the frequency with which many Arab and Persian horses suffer, in that country, from a chronically enlarged condition of the testicles and spermatic cord, usually brought on by the presence of *filaria equina* (p. 345). The late Mr. J. H. Steel ("Veterinary Journal," vol. xxvii., p. 327), when writing about "big testicle and dropsical cord," states: "Almost invariably on incision into the scrotum in hydrocele (dropsy of the scrotum), sarcocele (tumour of the testicle), and cases of adhesions of the testis to the scrotum, one or more specimens of the thread-worms in question wriggle through the incision, or come away with the hydrocele fluid."

Castration appears to be the only treatment which could be successfully applied to such cases.

Filariæ are also the cause of "worm in the eye" (p. 344), and of one form of kumree (p. 543).

The eggs and embryos of filariæ are to be frequently found in stagnant water (abundantly so in many parts of India), along with which they gain access into the alimentary canal of the horse that drinks the contaminated fluid. Being extremely minute, they become absorbed, or work their way into the blood-vessels and are taken into the blood-current to be deposited in some fitting resting-place, from which, on becoming fully developed, the worms issue into active life.

6. SPIROPTERA RETICULATA is a very thin, spiral-shaped worm, which is about 18 inches long, when full grown, and is found in fibrous tumours, principally, about the flexor tendons of the fore legs. The tumours are about an inch in diameter, and respectively contain a coiled-up worm in their centre. These parasites are also met with in the synovial bursæ of the fore legs. Removal of the tumour with the knife and subsequent antiseptic treatment (p. 74) of the wound are the appropriate remedies. The presence of the tumours gives rise to more or less lameness.

PREVENTION OF WORMS IN HORSES.—From a practical point of view the best way for preventing horses at grass from getting worms is to avoid infected pastures, keep them on dry soil, see that their water supply is pure, and allow them a liberal supply of rock salt. Professor Theobald wisely remarks that "one of the most important things to be done in an outbreak is to ensure the destruction of the dung, with its heavy complement of eggs, and thus prevent the distribution of the disease, as well as the continuance of it in an already infected area."

If the land on which the affected horses are grazed is under

suspicion, lime and salt may be freely used. If it be not convenient to break up the pasture (which is always the best plan), we may dress it about November with, say, 4 tons of quicklime to the acre. It will then be ready for stock to graze on it by the following March. Or we may dress it with half a ton of salt to the acre. Here, the amount of lime in the soil will be our best guide. "Salt, though not a direct plant food, has a most important indirect effect upon the potash, lime, and magnesia in the soil, effecting their decomposition, and rendering them in an available condition to be taken up by roots. In other words, salt acts as a purveyor to the plants. As regards lime, nothing need be said more than what is well known, namely, that it is a direct plant food, and indirectly it acts in many important ways, neutralising poisonous acids, and bringing about the decomposition of organic matter, etc." ("The Field"). After liming, salting, and, if possible, draining the infected land, horses should be kept off it for at least a year.

CHAPTER XX.

Non-parasitic Diseases of the Digestive Canal.

INFLAMMATION OF THE MOUTH AND TONGUE—COLIC—SPASMODIC COLIC—FLATULENT COLIC—FLATULENT DISTENSION OF THE STOMACH—WORM COLIC—INFLAMMATION OF THE INTESTINES—RUPTURE OF THE STOMACH, RUPTURE OF THE INTESTINES AND VOMITING—TWISTS AND FOLDS OF THE INTESTINES—INFLAMMATION FROM EATING SAND—IMPACTION OF THE STOMACH—GRASS STAGGERS—SUPERPURGATION—DIARRHŒA—SPECIFIC DIARRHŒA OF FOALS—CHRONIC INDIGESTION—CONSTIPATION—LAMPAS—CHOKING—PROLAPSE OF THE RECTUM—CALCULI AND CONCRETIONS.

Inflammation of the Mouth and Tongue (*Aphthæ, Pustular Stomatitis*).

The chief forms of inflammation of the mouth and tongue which we usually note in the horse are: 1. A superficial eruption on the mucous membrane, after certain diseases, somewhat similar to that we may see on the lips of a man, at times, during the convalescent stage of intermittent fever. 2. An inflammatory peeling off, in patches, of the mucous membrane of the mouth and tongue; with, perhaps, the formation of a small amount of matter (pus), at parts where the sores are deep. We may class these two forms under the heading of aphthæ. 3. A contagious inflammation (pustular stomatitis) which extends all over the mouth and tongue, and, generally, to the nostrils, as well as to the face, and even to other parts on which the discharge falls. The eruption consists of small nodules, or boils, which ulcerate, and run their course, as a rule, in about a fortnight. A good deal of discharge, and some swelling of the parts, accompany the inflammation. The ulcers lack the chancre-like appearance of those of glanders. The disease may be communicated to cattle and man. In some instances, the horse seems to have received it from cattle, in which case it would appear that contact with the discharge, left, perhaps, on fodder, would be

sufficient for the propagation of the virus, without abrasion of the surface of the mucous membrane. This disease is similar to the thrush of human beings and is due to the presence of a vegetable parasite, *oidium albicans*, which is a yeast fungus. For convenience sake I have included it in the present chapter, instead of the preceding one.

TREATMENT consists in frequent bathing of the part with a solution of 1 oz. borax, in 4 oz. glycerine, and 2 oz. of water; or of a saturated solution of borax, or alum in water. The animal should be carefully nursed, and have "soft" food to eat. Abundance of linseed tea would be an appropriate drink. In the contagious form, we might give liquor arsenicalis (p. 601) to act on the disease germs. In all cases, 2 oz. of bicarbonate of soda, mixed in the food, would be advisable.

Colic

being the manifestation of pain in the interior of the abdomen, is a symptom of various diseases, such as: irritation of the intestines, due to indigestion; worms (especially the *strongylus armatus*, p. 401); enteritis; hernia; twisted bowel; calculus in the intestines; obstruction, etc. Hence, when a horse is seized with an attack of colic, the person treating him should endeavour to find out the nature of the disease, so that he may try to remove the cause.

FREQUENCY OF COLIC.—Bollinger, who has collected statistics of many thousands of cases, states that about 40 per cent. of the attacks of internal diseases of horses may be put down to colic; and that the mortality from it is about 13 per cent., and about 40 per cent. of the general death-rate. My own experience is, that cases of colic are at least ten times more frequent among horses which live under ordinary stable conditions, than among those whose watering, feeding, and work are carefully and scientifically regulated. The great frequency and danger of colic in horses are due to the fact that they can very rarely vomit.

The GENERAL SYMPTOMS are those of spasmodic colic or flatulent colic (pp. 411 and 414); or of both, in more or less unequal proportions.

PRINCIPLES OF TREATMENT.—From the enumeration of the causes of colic, we can see that what would be curative in one case, might be fatal in another. For instance, the administration of a dose of aloes, which would speedily remove the cause of pain due to the presence in the intestines of indigestible food recently

eaten, would be an extremely bad thing to give to an animal suffering from colic arising from acute inguinal hernia, or long-continued constipation. In the former case, the aloes would greatly aggravate the congestion or inflammation of the imprisoned bowel; in the latter, by forcing the offending mass through the bowel, it might lead to rupture of the intestine, or might set up fatal inflammation. Hence, I would advise that as long as the cause of colic in any particular case remains unknown, it is best to continue to treat symptoms. Thus, if pain be the only symptom discernible, we might give Indian hemp, chlorodyne, or chloral hydrate: the first-named for preference. If we had a free choice of drugs, it would be well to limit the use of opium in colic to cases, like those of hernia, in which it is desirable to check the action of the bowels. If the colic be complicated by tympanites (distension of the abdomen with gas), we might also use turpentine, which has a powerful effect in checking fermentation. Puncturing the large intestine (p. 677) is a very efficient means for relieving flatulency. As soon as we find out what is causing the pain, we should of course seek to remove it. By, however, treating the symptoms of pain and flatulency, we not only do no harm; but may save the animal's life by relieving distressing symptoms which might kill the patient by their intensity.

Horses which are subject to colic without ostensible cause, should be regarded with extreme suspicion; for such attacks are often indicative of the presence of calculi in the bowels, of colic brought on by the palisade worm (p. 401), or of other grave affections.

The division of abdominal pain into spasmodic colic and flatulent colic is an arbitrary one which has no merit beyond that of the sanction of custom. We should bear in mind that colic may occur in several ways, without there being either spasm or flatulence. Instead of these terms, I venture to suggest those of colic without flatulent distension, and colic with flatulent distension.

Spasmodic Colic

is the term applied to spasm of the muscular coat of the intestines, generally caused by irritation due to the presence in them of undigested food. It may also be caused by chill. It is usually brought on by injudicious watering and feeding, especially, when the horse is exhausted by hard work and long fasting; for the digestive apparatus is then in a weakened state. Some animals, from natural or induced weakness of these organs, are prone to colic at all times, unless when carefully managed. This form of

colic is rare among horses which are properly fed and looked after.

In England, spasmodic colic is generally due to spasm of the small intestine; and in Scotland, to that of the large bowel, on account of its becoming obstructed by the excess of woody fibre contained in the grass of that country. Hence, as we shall see further on, it is safer to give a purgative in cases of spasmodic colic in England than in Scotland.

As mistakes are liable to be made in deciding if the attack is one of colic or inflammation of the intestines; the person in charge of the patient should carefully study the symptoms of both diseases before deciding on a doubtful case, supposing that he cannot obtain the help of a veterinary surgeon.

Entire horses, when suffering from colic, especially when they show a tendency to lie on their backs, should be examined for hernia.

SYMPTOMS.—The first symptoms are usually: disinclination to go on, if at work; depression; uneasiness; pawing with a fore foot; arching the back; looking round at the flank; and making attempts to lie down, which the patient does very carefully at this stage. As the attack proceeds, the animal may cow-kick at his belly, or seek relief from the pain which has seized him, by rolling on the ground. During these times the pulse will be frequent, breathing laboured, and body more or less covered with patches of perspiration. There are distinct intervals of freedom from pain; the commencement of an intermission being, perhaps, marked by the horse starting up on to his feet—after rolling and struggling—and beginning to walk round his box, feed, or look about, as if nothing had occurred. Another attack soon comes on, with more or less violence; and the pain gradually passes off, or the animal throws himself about and dies from exhaustion, or from some other complication. While pain lasts, the skin over the abdomen is not sensitive as it is in inflammation of the stomach and intestines; and pressing and rubbing it seems to give relief. During the intervals of rest, the condition of the breathing, pulse, and skin is normal, or nearly so. During the periods of pain, the pulse is frequent and full. The best distinguishing symptom is that the pain is intermittent. Among unfavourable symptoms we find: a cold and wet (from perspiration) condition of the surface of the body; high internal temperature; frequent, small, and hard pulse (showing development of inflammation; see p. 416 *et seq.*); difficulty of breathing; and a haggard expression of the face. The act of staling in a normal and easy manner is a very hopeful sign.

TREATMENT.—Gamgee taught that colic being due to the presence of some undigested irritating substance in the bowels; its rational treatment is removal of the offending matter by purgatives and enemas. This practice, as I have pointed out on pp. 410 and 411, is not always safe. Besides, a strong purgative would unfit a horse for work for a few days. The employment of an antispasmodic, such as turpentine, chloric æther, chlorodyne, or even alcohol, is as rational as that of a purgative; for the antispasmodic, like the purgative, stimulates the intestine to get rid of the offending material, without, however, causing the discharge of watery fluid. We should also remember the fact that untreated colic is not necessarily fatal. In fact, the majority of cases of colic would recover if left alone.

In ordinary cases, I give the following drench:—

Turpentine	2 oz.
Linseed oil	1½ pint.

Some practitioners prefer an ounce of chloric æther to the turpentine in the above draught.

In these cases, linseed oil acts very usefully as a gentle aperient which does not cause watery evacuations, and as a protective vehicle for the turpentine. The turpentine checks the formation of gas, and stimulates the motion of the intestines. It may be given in gruel (as a drench), if the oil be not procurable.

If relief be not obtained, give a subcutaneous injection (p. 633 of eserine (p. 609), and, if necessary, 1 oz. of chloral hydrate in a pint of water, as a drench. Above all things, we should exercise patience.

The following is a useful ball for colic in Asiatic countries where its component drugs can, as a rule, be easily procured:—

Opium...	1½ drachm.
Asafœtida	1 ,,
Camphor	2 ,,

If, in the first instance, nothing else is to be had, we may give a quart of warm ale, fortified by a quarter of a pint of spirits and a tablespoonful of powdered ginger; or, better still, an ounce of chlorodyne in a pint of cold water.

The horse should be kept quiet in his stall, with plenty of bedding under him, so that he may relieve himself by rolling, and should not be distressed by exercise. If, however, he begins to throw himself about violently, it is advisable to give him the chloral hydrate already advised, in order to prevent him injuring himself internally. He may have one or two enemas of warm water; the surface of his body should be well hand-rubbed; his

abdomen fomented; and he should be kept warm. A catheter (p. 655) should be passed, if the bladder is full.

Flatulent Colic.

This dangerous form of colic is due to the distension of the bowels by gas, resulting, generally, from the decomposition of undigested food contained in them. It sometimes follows spasmodic colic, in which case, we have, in the first instance, spasm due to irritation set up by the presence of undigested matter; and, subsequently, distension, owing to its decomposition.

We may conclude that flatulent colic is usually caused by errors in feeding and watering the horse. Perhaps, he has been given a large quantity of rank grass, watery roots, or boiled grain, which, on account of its moist nature, is quickly swallowed without being properly masticated. The gastric juice, being too much diluted by the fluid portion of the forage, performs its office imperfectly; decomposition takes place; and the bowels become filled with gas. Or, the thirsty horse, after feeding, may have had a draught of water which may have diluted the gastric juice to an injurious extent, or may have checked its secretion by chilling the stomach, and we may get a case similar to the one just described. Or the horse may have been worked soon after being fed. Here the muscular labour will tend to check the secretion of gastric juice, and arrest the movements in the stomach which are necessary to digestion; distension and colic being the probable results. Feeding horses immediately after work, without watering them, is apt to cause colic.

Horses which are fed on large quantities of boiled food, frequently become chronically disposed to attacks of flatulent colic, from the fact of their stomach having become weakened from continued overdistension.

In Northern India, horses are generally fed on a kind of pea, called gram. As it is hard and dry, some persons ignorantly consider that it should be well soaked in water before being given to the horse. If this be done, the gram is imperfectly masticated, and the bolus of food, instead of being thoroughly mixed with saliva before entering the stomach, in which state it would be ready for reception by that organ, is simply saturated with water. Sometimes, the gram is steeped so long that fermentation actually commences in it before it is given to the horse. Naturally, this system of feeding is a fruitful source of indigestion, and occasionally produces colic.

Some years ago, watering after feeding was a not unfrequent practice in batteries of artillery and regiments of cavalry in

India, and was, of course, attended by many cases of colic, with instances of rupture of the stomach, now and then. I am glad to say that such barbarous methods are falling into disuse in that country. Watering after feeding is particularly dangerous when gram is used; as gram readily ferments on being soaked in water.

SYMPTOMS.—The symptoms resemble those of spasmodic colic, except that they are less violent, though much more continuous, and there is considerable distension of the abdomen, which distension is well marked in "the hollow of the flank," immediately in front of the point of the hip. The breathing is difficult, and there is more or less delirium in bad cases.

Great distension of the abdomen is often a sign of a fatal termination of different diseases, as in superpurgation, for instance.

Laminitis sometimes ensues after an attack of this form of colic.

TREATMENT.—Give the drench recommended on p. 413, or an ounce of chlorodyne in a pint of cold water. I like to give the turpentine and linseed oil drench in the first instance, and if it does not appear to have relieved the symptoms in, say, half an hour, to give the chlorodyne, which may be repeated later on. Or eserine (p. 609) may be tried with advantage. It is well to foment the belly, back-rake, and to give an enema of a gallon of water. Hand-rubbing and fomenting the abdomen will afford some relief.

Medicines in a solid form, though appropriate in spasmodic colic, should not, as a rule, be given in flatulent colic.

If medicines fail to overcome the attack, the intestines should be punctured in the manner described by Peuch and Toussaint, from whose work on "Veterinary Surgery" I have abridged the description in p. 677 *et seq.* This operation is a very efficient means for the relief of flatulent colic.

Flatulent Distension of the Stomach.

The return of food, or the belching of gas, from the stomach of the horse, is almost completely prevented by the fact that the calibre of the gullet at its opening into the stomach, is particularly small, and that it is completely obstructed by folds of mucous membrane (Chauveau). Usually, the dissolved food and any superabundant gas obtain ready escape from the stomach into the intestine; the unprepared portion of the food being kept back, by closure of the intestinal orifice due to the irritation which such

food causes the powerful muscle (sphincter of the pylorus) which surrounds it. Colonel F. Smith points out that it may also be closed by the distended stomach pressing on it. The fact of vomition being almost impossible to the horse, as a healthy means of relieving the stomach; he is rendered by this inability, peculiarly liable to rupture that organ, an accident which is not unfrequently the fatal termination of the disorder we are considering.

The usual CAUSE of this complaint is the eating of food which is liable to ferment in the stomach, especially when it has been imperfectly masticated. Wind-sucking, and stricture, or blocking up of the gut by a calculus, at its exit from the stomach, may also give rise to it.

The SYMPTOMS are those of very aggravated colic. There is a certain amount of distension of the bowels, though not to the same extent as in flatulent colic. The gaseous distension "is plainly seen to be under the ribs, forward in fact; the animal may now stand persistently with the elbows turned out to increase the capacity of his chest; a gurgling sound is heard in the œsophagus due to eructations of gas, followed, perhaps, by vomiting; saliva flows from the mouth; the expression is one of the greatest anxiety; head symptoms may now appear" (*Fred. Smith*).

The TREATMENT should be the same as for flatulent colic. If the intestine also is distended, it should be punctured (p. 677), so as to favour the escape of gas from the stomach.

Worm Colic. See p. 403.

Inflammation of the Intestines (*Enteritis*).

NATURE AND CAUSES.—Formerly, acute abdominal pain was generally divided into colic and enteritis (inflammation of the intestines); the usual distinction being that the pain in the former was intermittent, and in that of the latter continuous and much more severe. Williams states that enteritis is "the most rapidly fatal disease to which the horse is liable." Its occurrence was ascribed to all sorts of different causes, such as chill, over-fatigue, twists and folds of the intestines (p. 420), calculus, indigestion, colic, worms, poisons, bacteria, constipation, etc. It is therefore evident that the term enteritis has served to cover several different disorders. Professor Penberthy states that: "I am inclined to the view that by far the most common cause of enteritis in the horse is the intestinal parasite." The continuously acute pain and frequently fatal results of twists and folds of the intestines

are often accountable for these diseases, being mistaken for enteritis. True enteritis is regarded as inflammation of the mucous membrane of the intestines, unconnected with chemical or mechanical irritants. In olden days, when the feeding and watering of horses were carried on under principles far less sound than those now in vogue, enteritis was far more common than at present. We can easily understand that colic which is due to indigestion and which is neglected or wrongly treated (as for instance, by too severe purgatives), may easily run into enteritis; the change being one of congestion into inflammation.

SYMPTOMS.—The animal is in a state of "extreme restlessness and distress; he is either pawing, or repeatedly lying down and rising again; or else he is walking round his box, breathing hard, sighing, and perhaps occasionally snorting. At length his respiration becomes hurried and oppressed; his nostrils widely dilated; his countenance painfully anxious and expressive of his sufferings; his body bathed in sweat at one time, but at another cold, and occasionally seized with tremor; and his tail erect and quivering.

"The next stage borders on delirium. The eye acquires a wild, haggard, unnatural stare; the pupil dilates; his heedless and dreadful throes render approach to him quite perilous, in short, he has become an object not only of compassion but of apprehension, and seems fast hurrying to his end; when all at once, in the midst of agonising torments he stands quiet, as though every pain had left him, and he was going to recover. His breathing becomes tranquillised, his pulse sunk beyond all perception; his body bedewed with a cold, clammy sweat; he is in a tremor from head to foot, and about the legs and ears has even a death-like feel. The mouth also feels deadly chill; the lips drop pendulous; and the eye seems unconscious of objects. In fine, death and not recovery is at hand. Mortification has seized the inflamed bowel; pain can be no longer felt in that which but a few minutes ago was the seat of exquisite suffering" *(Percivall)*.

As inflammation of the mucous membranes is characterised by a tendency to spread over the entire mucous surface; the mucous membranes of the eyelids and nostrils have an abnormally red appearance in this disease. The internal temperature is high, pulse wiry (small and hard) and frequent, the pain continuous, and pressure on the abdomen by the hand causes pain. There is generally more or less distension of the intestines from the evolution of gas, due to fermentation of food.

The POST-MORTEM APPEARANCES are those of intense inflammation of the mucous membrane of the intestines to a greater

or less extent. Inflammation of the intestine set up by partial or complete twist of the intestine would in all probability be much more local in extent than inflammation which was not due to a mechanical or chemical irritant.

DISTINGUISHING SIGNS BETWEEN ENTERITIS AND OTHER DISEASES.—Here, the history of the case will usually be a valuable guide. The chief differences between true enteritis and colic from indigestion are, that in the latter, the pain comes on in paroxysms, between which there are intervals of ease, during which the pulse, breathing, skin and mucous membranes are almost, if not quite, in a normal condition; rubbing and pressing the belly with the hand seem to ease the pain; and the animal appears to obtain temporary relief from rolling on the ground. In true enteritis, the reverse of all this is the case; the mucous membranes are abnormally red; the skin, in the later stages, is colder than usual; and during the paroxysms of pain, the pulse is frequent and wiry; not frequent and full, as in ordinary colic. The course of true enteritis is far more severe, more rapid, and more fatal than in that of the other disease. In acute pain from worms, the presence of these intestinal residents in the dung will help the diagnosis. The attitude of horses suffering from twists or folds of the intestines should also be studied in this respect. Further information on these points can be obtained by referring to the symptoms of other diseases of the ailmentary canal.

TREATMENT.—In order to give rest to the inflamed part, to allay the pain, and to enable the animal to tide over the attack, we can give him $\frac{1}{2}$ oz of cannabis indica (Indian hemp) in a ball, or 1 oz. of chloral hydrate in a pint of water, and repeat as may be required. If flatulency be present, we may give 2 oz. of oil of turpentine in a pint of linseed oil. The body may be fomented (p. 664) with warm water, and an enema of the same fluid may be administered.

During convalescence, care should be observed in giving food, which may consist of small quantities of bran and linseed mashes, with a few scalded carrots and a little grass after a time. Dry food should be avoided.

Rupture of the Stomach, Rupture of the Intestines and Vomiting.

Rupture of the stomach is often a complication of flatulent distension of that organ. It is specially liable to take place when

the walls of the stomach are abnormally weak, and when the colic-affected animal severely tests the strength of the distended organ by throwing himself down on the ground in agony. The continued feeding of horses on large quantities of bulky food (boiled turnips for instance) tends to permanently enlarge the size of the stomach, and to proportionately weaken its walls, as well as its digestive power. Taking into consideration the fact (which we can prove by experiment on the dead animal) that no air will escape from the stomach into the gullet, if the stomach is filled, even to the point of bursting, with air from its intestinal opening; we can easily see that rupture of the stomach may readily occur when the intestinal canal is blocked up (by undigested food, or twist of the intestine, for example), and when the contents of the stomach is in a state of fermentation. It is almost needless to say that the nearer the seat of the obstruction is to the orifice by which the stomach opens into the intestine, the greater will be the danger of this accident. We learn from the "Prussian Military Report" of 1891 that obstruction of the intestine was the cause of 33 cases of rupture of the stomach among the horses of the Prussian army during that year.

RUPTURE OF THE INTESTINES is also a complication of flatulency, and, like rupture of the stomach, is greatly aided by the presence of an obstruction which prevents the generated gas from escaping by the anus. Owing to the fact that the human stomach can, comparatively easily, get rid of undigested food by vomiting; rupture of the intestines is much more common in man than rupture of the stomach. The converse, I believe, is the case in the horse. Having no *data* to go on respecting the characteristics of rupture of the intestines, I shall confine my remarks here to rupture of the stomach, which may involve all three (serous, muscular, and mucous) coats, and thus be complete, or incomplete, in which case the muscular coat is, I believe, the one usually affected.

THE CHIEF SYMPTOMS OF RUPTURE OF THE STOMACH are vomiting, and more or less sudden collapse of the vital powers, preceded by great gaseous distension and violent colic. In vomiting "the muscles of the abdomen and neck are the seat of convulsive contractions; the bent head is kept close to the chest, at the same time a yellowish green, frothy liquid of the odour of chyme, and of a consistence somewhat similar to that of the partaken forage, flows from the nose or from the mouth. The quantity varies from a few spoonfuls to a stable bucketful or more. The animal sweats abundantly, the legs are drawn up under the body, and the eyes are haggard and fixed. Immediately after the vomit-

ing, the patient becomes very weak, trembles and staggers, and sometimes is seized with violent fits of coughing. In some cases the act of vomition is not completed, but stops at a flow of saliva from the mouth, nausea, and belching" *(Friedberger and Frohner).* Colonel Fred Smith states that, as a rule, when a horse vomits, the rejected food and fluids dribble from the nostrils, and are seldom violently discharged.

RELATIONS OF VOMITING AND RUPTURE OF THE STOMACH.—Although vomiting occurs so frequently in cases of rupture of the stomach, that the former might be accepted as a well-marked symptom of the latter; no necessary connection exists between the two. In fact, vomiting cannot be a consequence of complete rupture of the part; for the contents of the distended stomach would have, through the rent in that organ, a far readier way of escape, than through the usually closed passage from the stomach into the gullet. Besides, there have been recorded numerous cases of rupture without vomiting, and of vomiting without rupture. Bearing these considerations in mind, it seems reasonable to conclude that when vomiting occurs, it does so before rupture of the stomach takes place, or before such rupture becomes complete. Anyhow, we may accept the fact that vomition in the horse seldom, if ever, takes place unless the stomach is distended nigh unto bursting. The manner in which the contents of the stomach, in the act of vomiting, overcome the resistance offered by the narrow passage from the stomach to the gullet, has not yet been satisfactorily explained.

Cadéac remarks that vomiting without collapsus (more or less sudden failure of the vital powers) is generally an indication of a speedy recovery.

TREATMENT is of little or no use in cases of rupture of the stomach, or of vomition.

Twists and Folds of the Intestines.

Apart from the various kinds of herniæ, the intestines are liable to constriction (drawing together) by alteration of position, chiefly, in the two following ways:—

1. By *twist* (*volvulus*). When this accident takes place, it almost always affects the large intestine, in which case there are continuous colicky pains of gradually increasing severity with flatulent distension of the belly, and constipation after the part of the bowel behind the accumulated gas has cleared itself out; supposing that the twist is complete. In this case the rejected

dung gives off a peculiar odour which is characteristic of intestinal inflammation. By passing the hand into the rectum "one feels the distended colon (large intestine), which may for the moment be mistaken for the over-filled urinary bladder, but careful examination reveals its real nature. The longitudinal muscular bands can be distinctly felt, and show, not only that we have to do with the colon, but also in what direction torsion has occurred. When the bowel is in its proper position, they run nearly parallel with the long axis of the body; but in twists, a change in their course is distinctly appreciable" (Dollar's translation of Möller's "Surgery"). "Owing to the intense pain, the animal assumes various attitudes, which are in no way characteristic, because they are seen in all kinds of intestinal strangulation. He may lie down in the position of the Sphinx; sit on his haunches like a dog; lie on his back with his legs drawn up; kneel down; work his head up and down, as horses do when suffering from strangulated hernia; get on his legs, while shrieking with pain; rear; grind his teeth; show signs of madness; or throw himself on the ground, like an inert mass. His face expresses extreme depression and sadness. His body is covered with sweat; and his ears and limbs are extremely cold" (*Cadéac*).

Unless the normal position of the bowel be mechanically restored, the attack, as a rule, terminates fatally is from one day to a week, according as the stoppage is complete or partial. In the horse, as in man, the chief cause of twist of the colon is probably habitual constipation.

2. By *invagination* (*intussusception*), which, in nearly all cases, is confined to the small intestine (Cadéac). This accident occurs when one portion of the intestine (almost always the upper) passes into the part next to it. Thus, an intussusception consists of three thicknesses of intestine on each side. If double, there will be five thicknesses. The causes are obscure, and the symptoms are somewhat similar to twist. Inflammation occurs from this altered position of the intestine, and the two serous coats which come together, become more or less united. Intussusception is also a frequent post-mortem appearance. When it occurs after death, there is an absence of inflammation of the part, and the fold can be readily pulled out; as there was no attempt at union between the two serous coats which were temporarily in contact.

CAUSES.—Never having seen an instance of twist of the intestines caused by struggling on the ground, however desperate it might be, in many hundreds of cases of horses which I have made lie down in horse-breaking experiments, I am strongly of opinion that such violent movements never induce twist of the bowel; unless, pos-

sibly, the relative positions of its parts are altered from their normal condition by some unusual cause, such as distension. Hence, in ordinary spasmodic colic, without flatulence, I see no objection to allowing a horse to roll. In fact it appears that twists and folds of the intestines are often caused by preventing horses which have colic, from lying down and rolling. The partial paralysis of the intestine caused by aneurisms and emboli set up by palisade worms (p. 402) is undoubtedly a frequent cause of twists and folds in that portion of the alimentary canal.

The SYMPTOMS are described as follows by Cadéac: "At first more or less violent colic tortures the animal, who is distressed and anxious. His nostrils are dilated; his lips tremble; his jaws are clenched; his eyes, which are widely staring, are at first brilliant, but subsequently dull; his back is arched and rigid; he paws the ground and looks round at his flanks. The pain increases in intensity; the horse sits on his haunches like a dog; he works his head up and down; and makes disordered and jerky movements.

"He may make attempts to vomit, which sometimes cause the expulsion, through the nostrils, of a green liquid mixed with food, and with a smell resembling that of the stomach. Occasionally, by his violent efforts to vomit, he throws up small and hard particles of dung, covered with thick mucus, and sometimes accompanied by gangrenous portions of the intestine. His belly and flanks are painful to the touch, but are not much distended. The rumbling of the large intestine can be heard only at the beginning of the attack."

Mr. J. G. Rutherford states that "diagnosis is in most cases possible, owing to a very peculiar symptom almost invariably present, and which I have not seen mentioned in the text books. I refer to an odd, sudden, jerky crouch, caused, I think, by the pain from the invagination of successive sections of bowel."

The *appearances after death* are: local discoloration, from inflammation of the strangulated bowel, and a thickened condition of the affected intestine. These changes affect the entire thickness of the bowel, that is, the mucous, muscular, and serous coats. When the abdomen is opened, the twist, usually, becomes undone; so that there is nothing to mark its previous existence, except the discoloration.

TREATMENT.—Curative measures are very uncertain in this malady. As palliative treatment, it is best to give 1 oz. of extract of Indian hemp. If we cannot obtain that drug, we may give 1 oz. of chloral hydrate; $\frac{3}{4}$ oz. of opium; 8 oz. of laudanum; or inject hypodermically 10 grains of hydrochlorate of morphine. Large doses of linseed oil might be tried.

In twist of the large intestine, Mr. J. G. Rutherford ("Proceedings of the Veterinary Association of Manitoba"), who is Chief Veterinary Inspector of Canada, has often had successful results by allowing the animal perfect freedom to roll, and by giving enemas of large quantities of luke-warm water, while keeping the animal's hind quarters raised eight or ten inches higher than his forehand, so as to help the water to penetrate well forward into the bowel. He prefers Gamgee's enema funnel to a pump or syringe for this work.

Yelkmann and Möller advise passing the hand into the rectum and trying to undo the twist, after giving an enema (see Möller's "Surgery," translated by Dollar).

Nothing can be done for twist of the small intestine, in which the symptoms are similar to those of twist of the colon, except as regards the condition of the bowel, which, in twist of the colon, can be felt by passing the hand into the rectum.

Inflammation from Eating Sand *(Sand Colic)*.

When horses are bedded down with sea sand, or with river sand which contains saline matters, they are very apt to eat large quantities of it, and consequently to suffer from a very dangerous form of inflammation of the intestines. Many instances are on record of troop horses having become thus affected after having been picketed on sand. Inflammation may also be brought on by the presence of irritating materials in the food. "In the death-reports it is constantly remarked what large amounts of gravel and indigestible rootlets are found in the intestines, which have been introduced with the grain and grass" ("Veterinary Returns of the Madras Army").

Vederniikoff, who describes this complaint under the name of "Kumgata disease" (sand disease), states that it occurs among the horses of the Kirgis steppes.

In some cases, morbid appetite may account for the propensity. A certain proportion of healthy horses will always—particularly, if they have not had a free supply of salt—eat sea sand when bedded down with it. The precautions to be observed are obvious.

Horses have been known to eat, with, naturally, fatal results, quantities of 80 lbs. and upwards of sand.

The SYMPTOMS are intense colicky pains, and the passage of sand, etc., with the dung.

The usual TREATMENT consists in keeping the animal on mashes and boiled food, through which about four ounces of linseed oil

should be mixed at each feed; and the pain should be allayed by ½ oz. of chloral hydrate in a pint of water. No attempt to get rid of the sand by purgatives should be made; for, if this be done, the gritty particles, on becoming forcibly impelled through the bowels, would wound them, and would consequently set up inflammation to an almost certainly fatal degree. A few copious enemas may be tried with advantage.

Mr. J. M. Lund, C.V.S. ("Vet. Record," 6th July, 1901), has had very successful results in South Africa with many cases of sand colic by starving the animal for three or four days, giving him a pint of linseed oil containing a few drops of carbolic acid, morning and evening, and allowing him only a small quantity of water to drink. He reduces the amount of oil, if it purges the horse too much.

Veterinary Surgeon Desmond tells me that in Australia they cast the horse in a furrow, and let him move the sand by rolling.

Impaction of the Stomach (*Stomach Staggers*).

In this condition, the stomach becomes gorged with food which it is unable to get rid of. The practice of feeding horses on large quantities of boiled food predisposes these animals to this complaint, as well as to rupture of the stomach; for damp food is rapidly swallowed without being properly mixed with saliva, and is, consequently, more difficult of digestion than if it had been thoroughly masticated, and is also more liable to ferment and cause the evolution of gas. The resulting distension will tend to strain the muscular wall of the stomach, and, if frequently repeated, will render it thin and weak; in which state, it will be incapable of efficiently performing its office of churning up and finally expelling the food. The functions of the gastric glands will also become impaired. Long fasting and overwork will assist in weakening the powers of the stomach. Wheat and other unsuitable articles of food are apt to produce impaction. Gaseous distension of the stomach, which probably accompanies impaction in the large majority of cases, is often brought on by watering thirsty horses soon after they have been fed. They should, of course, be watered previous to feeding.

SYMPTOMS.—Colicky pains. Pawing with the fore feet, "especially the near one" (*Williams*). Belching. Attempts at vomiting. Tremblings. Partial sweats. "Discharge of liquid matter from the nose" (*Robertson*). Frequent pulse and quickened breathing. In some cases, as remarked by Robertson, the chief symptoms are those of semi-unconsciousness. The animal leans his head against any convenient support; staggers, if forced to walk; and

breathes in a snoring manner. The pulse is full and slow. This last condition is that which is popularly called "stomach staggers."

TREATMENT.—Treat as for colic. The horse should be well bedded down, lest rupture of the stomach might take place when rolling, during the paroxysms of pain. We should bleed, if the animal is more or less unconscious, and the pulse full and slow.

Grass Staggers

is caused by the eating of over-ripe grass, especially rye-grass, at a time when a peculiar and poisonous narcotic principle is developed in it, as appears to happen in certain seasons. The disease is liable to affect a large proportion of animals which are under the same grazing conditions.

The SYMPTOMS, generally, take two or three days to become developed. The animal gradually becomes more or less unconscious and paralysed, and staggers if forced to walk. Although he may have great difficulty in keeping on his legs, he is extremely averse from going down, and leans for support against any convenient object. He breathes in a snoring manner. The mucous membranes are tinged with yellow. Convulsions, or spasms like those of tetanus, may come on.

Recovery may be expected in cases which are not marked by extreme symptoms.

TREATMENT.—Give a subcutaneous injection (p. 633) of eserine (p. 609) or a full dose of aloes (p. 599), combined with a drachm of calomel. Bleeding (p. 638) may be tried. Back rake and administer a couple of enemas (p. 632) of warm water.

Superpurgation

is the term applied to excessive diarrhœa brought on by the action of purgative medicine.

CAUSES.—Giving too strong a dose of aloes; giving a second dose before the first one has commenced to act; exercising the horse before or soon after the physic has "set" (physic is said to "set" when the purging ceases and the dung begins to assume its normal appearance); administering aloes without preparing the animal for it; allowing him to drink a large quantity of cold water shortly after giving aloes; giving aloes on an empty stomach and then keeping the horse without food, etc.

"We should be very careful in putting a horse to work soon after giving him a dose of aloes which has failed to move him; for the longer a purgative is retained in the body, the greater the danger from its superaction" (*Williams*).

SYMPTOMS.—Frequent purging. Loss of appetite. Debility. Weak pulse. The dangerous symptoms are: offensive breath; bad smell from the evacuations; glassy eyes; and distension of the belly with cessation of purging, caused by the bowel losing the power to perform its natural movements on becoming inflamed. Laminitis frequently results from superpurgation.

TREATMENT.—If the symptoms are not very urgent, the action of the physic should not be checked further than by keeping the animal warmly clothed, quiet, and allowing him only small quantities of thin gruel made from flour or rice, or boiled milk to drink, care being taken that the milk, if it be used, is not smoked in the slightest; for it would then be distasteful to him. On no account give linseed or roots, as they are laxatives.

If the horse gets worse, or if symptoms of colic appear, foment the belly with hot water, and give an ounce of chlorodyne, or 3 oz. of laudanum, in a quart of rice or starch water, or in water in which a little flour has been boiled. If this does not afford relief, repeat, after a couple of hours, the chlorodyne, or the laudanum and rice water combined with 1½ oz. of sweet spirits of nitre. We should bear in mind that the fluid in which the sweet spirits of nitre or chlorodyne is given should be cold. If the horse be very weak, a bottle of port wine may be given. If neither opium nor laudanum be at hand, substitute for them camphor in 2-drachm doses. To support the strength, we may give boiled milk with eggs beaten up in it. In superpurgation, a few bruised oats and dry bran with some well-preserved hay may be supplied from time to time; as they are useful to stop the purging. Bran mashes should not be given; as bran in that form is a laxative.

If distension of the abdomen appears, give 2 oz. of turpentine in a pint of gruel.

During convalescence, the patient should be very carefully and gradually brought on to his ordinary food, and he should be kept quiet and free from excitement; because any unexpected or unusual noise or bustle may bring on a fit of purging.

Diarrhœa.

Many horses, more particularly slack-loined, slight, "washy" animals, purge if worked or excited, as we may observe among race-

horses, by their being taken to a racecourse. Such animals are often liable to diarrhœa from trifling changes of food or of temperature. The practice of working horses soon after they are watered or fed, especially after long abstinence from water or food, is very apt to cause them to purge; because the exertion interferes with the function of digestion by drawing blood to the muscles of the limbs away from the stomach, intestines, and other organs of digestion. It is evident that unduly long abstinence weakens the power of digestion. Diarrhœa may be simply an effort of nature to expel some irritating matter from the bowels or from the blood; in which case, it should on no account be prematurely checked. It may also be due to worms.

In India, horses frequently get diarrhœa from being fed on an excess of gram, which is a grain almost identical in composition with peas, and which has a very "heating" effect on the system, owing to the large proportion of albumin it contains. A cure may be rapidly accomplished by giving a few bran mashes, followed by a considerably decreased supply of gram, which had best be mixed with dry bran.

Three or four pounds of dry bran, divided between the four or five feeds which a horse gets daily, will have a binding effect. Mashes made of linseed and bran will aid in allaying irritation. In all cases it is judicious to allow horses a constant supply of water in their stalls. As work tends to stop the process of digestion in proportion to the shortness of time between it and feeding; horses which are inclined to scour should have a long interval of rest after eating their corn. Even a drink of water given shortly before exercise, will cause some "washy" animals to purge. A feed early in the morning, quickly followed by work, is particularly liable to bring about this condition. Such horses should always have chopped hay mixed through their corn, or have hay in the stall at the same time as they are consuming their allowance of corn, in order that their food may have a sufficiently large proportion of woody fibre. A small proportion of beans may be used with advantage.

If a horse be a greedy feeder, he should have some hay before each feed.

The oats given should always be bruised; for, in that state, they will require to be more thoroughly masticated than when whole. Besides, the hard husk, which might have an irritating effect on the intestines, will become broken up.

The corn may be given from a trough or sheet placed on the ground, so that the animal will be obliged to take a considerable time over its consumption.

In cases where the diarrhœa is brought on by improper food, give

a pint of linseed oil and attend carefully to the diet. For plain water, substitute rice water or thin flour gruel. Give bruised oats and dry bran. Keep the horse warmly clothed and comfortably stabled. If the horse's mouth has a sour smell, mix 2 oz. of bicarbonate of soda (baking soda) in his food daily. If the case does not yield to these simple measures, give once or twice a day, after purging, an ounce of laudanum in a pint of rice water. If this fails, administer the following ball:—

Powdered opium	1 drachm.
Powdered catechu	2 drachms.
Subnitrate of bismuth...	2 ,,

Treacle enough to make up into a ball.

A little port wine, spirits and warm water, or ounce doses of sweet spirits of nitre, may be given now and then, if the horse be very weak.

Fearnley strongly advises the employment, in cases of simple diarrhœa, of Dick's colic draught, which I have found to act well in such cases, and which consists of—

Linseed oil	1½ pint.
Oil of turpentine	2 oz.
Laudanum	2 ,,

In the treatment of diarrhœa, several German veterinary surgeons have had excellent results from the internal administration of tannoform, in doses of from 6 drachms to 4 ounces, either as a drench (in camomile tea or linseed tea), or in a ball.

We should always be careful not to administer too much physic, and should avoid checking diarrhœa suddenly by medicines, when milder means might suffice.

The not very uncommon practice, among horse dealers and grooms, of giving arsenic to improve the appearance of the skin, tends to cause irritability of the coats of the intestines, and to render the animal liable to diarrhœa.

Specific Diarrhœa of Foals.

NATURE AND CAUSE.—Cadéac, who gives an admirable account of this disease in his "Pathologie Interne des Animaux Domestiques," considers that the diarrhœa of foals is generally due to a specific infection, the action of which is favoured by unsanitary conditions. The following remarks, which I have taken principally from Cadéac's work, refer particularly to the severe and presumably infectious form, which is often mistaken for dysentery, and appears to be similar to "white scour" in calves. It is sometimes compli-

cated with umbilical pyæmia, acute laminitis, pneumonia, peritonitis, jaundice, and inflammation of the eyes. It generally runs a fatal course in from six to ten days. As a rule, it affects foals about the time of weaning.

PREDISPOSING CAUSES.—The chief predisposing causes are: A vitiated condition of the milk, from over-working the dam, from feeding her on improper food, or from the fact of her being in ill health; too prolonged intervals between the times of sucking; too early weaning; improper food given to the foal; chill; worms; and general debility. In the case of a sucking foal being kept for too long a time from his dam, he would, on again approaching her, be inclined to drink more milk than his stomach could digest, especially as that organ would be more or less enfeebled from continued fasting, which would also have the effect of reducing the suitability of the milk as an article of food. The undigested portion of the milk would act as a foreign body in setting up irritation in the stomach and intestines.

SYMPTOMS.—"At first, the foal is depressed, weak, and remains lying down for a long time. He ceases to gambol about his mother, his coat is dry and staring, and his eyes are sunk in their sockets. The mouth is dry and hot, thick saliva falls from it, and the tongue is soft and flabby. Although he refuses to suck, his thirst is intense, and he eagerly drinks any fluid given to him.

"His flanks are tucked up, the surface of his abdomen is tense and painful to the touch, and the rumbling of the bowels can be heard. He gets severe colicky pains which cause him to stamp. Diarrhœa comes on from six to ten hours after the appearance of the first symptoms. The evacuations are frequent, watery, stinking, mixed with clotted matter, and at first are yellow. They soon become involuntary, frothy, more and more frequent, greyish white in colour, and mixed with mucus. The patient sometimes discharges glairy or yellow masses which have a disgusting smell. The evacuations soil the thighs and neighbouring surfaces, and irritate the skin, so that a rash is set up, and the hair falls off. The injury thus effected is often greatly increased by the foal rolling.

"The mouth and the expired air have a putrid smell. The pulse, which at first was hard and quick, becomes small and wiry; the beats of the heart are strong; the lining membrane of the eyes is injected, and sometimes has spots of extravasated blood on it. The internal temperature is high. Weakness increases more and more, and the animal dies of exhaustion, sometimes even in three days" (*Cadéac*).

TREATMENT.—With sucking foals, attention should be at once paid to the mare, and if there is anything wrong with her, it is well, if practicable, to take the patient away from her and put him to a healthy foster-mother. The first great point in the medicinal treatment of this disease is to remove the cause, by disinfecting the stomach and intestines, by giving, for instance, from 45 to 75 grains (according to the age of the foal) of tannoform (p. 625) four times a day in linseed tea, or mixed in honey or treacle. Bass, Hermann and Wulff speak very highly of the good effects of tannoform in this disease. With respect to other antiseptics for internal use with foals, we might give, in the same way, 1 drachm of salol (a preparation of carbolic acid and salicylic acid); $\frac{1}{2}$ drachm of creolin in $\frac{1}{4}$ pint of water; or 2 drachms of oil of turpentine in 2 oz. of linseed oil once or twice a day. Cagny advises the administration of a drachm of rhubarb a few times a day. The animal's strength may be kept up by giving daily four or five raw eggs.

Mr. Samuel Wharam, M.R.C.V.S., who has had great experience in this disease, tells me that malt extract has an excellent effect in checking the diarrhœa and in maintaining the animal's strength. A teaspoonful to a dessertspoonful of the dry powder is given every six or eight hours in the dam's milk.

PREVENTION consists in avoiding the predisposing causes, and in isolating the infected animals.

Chronic Indigestion (*Dyspepsia*).

The usual causes of this complaint are: improper food; an improper system of feeding and watering; imperfect chewing of the food by the animal, owing to bad teeth, or to the forage being given in such a form that he bolts it; constitutional tendency; and injudicious use of medicines. According to Williams, it is generally caused in young animals by drinking cold milk; by removal from the dam at too early an age; by sucking at too long intervals, or when the dam is heated by work.

SYMPTOMS.—The animal loses condition. The appetite is, generally, capricious and depraved. There is often acidity of the stomach, as is evinced by his grinding his teeth, and by his partiality for licking whitewashed walls. He may crib-bite, or wind-suck. The mouth has a sour smell. Cough often accompanies indigestion. The coat is out of order, being "hide-bound," dry, lacking its natural gloss, and being filled with dandruff, and frequently, the horn of the hoofs become shelly and brittle; these

conditions being due to the sympathy which exists between the skin, the sensitive laminæ of the feet, and the mucous membrane which lines the alimentary canal. The dung, owing to the absence of a proper supply of bile, which is a powerful deodorizer, has a foul smell, and is composed of imperfectly digested materials, the hay and corn being passed in a more or less unaltered condition. Hence, the dung loses its natural healthy colour and appearance. "In the stable, the horse is mostly inclined to be costive; but when taken to work or exercise is soon excited to purge" (*Percivall*). He is often subject to colicky pains, especially soon after being fed. The abdomen is frequently distended with gas, owing to the digestive organs being unable to take up what they require of the nutritive part of the food, and to expel the remainder before it decomposes.

TREATMENT.—Beyond advising the reader to avoid the causes of indigestion, I have little to say regarding its cure, which is chiefly a question of diet and stable management. A pint of linseed oil may be given as a drench once a week. Mix through the daily allowance of food, 2 oz. of the bicarbonate of soda, which is not only an antacid, but is also a sedative to the mucous membrane, and it assists the liver in the removal of deleterious matter from the blood. Not more than seven or eight pounds of corn, of which half may be dry bran, should be given; and the horse should have a liberal though judicious supply of carrots and green food. Much benefit is often obtained by allowing the animal, if he chooses, to eat earth, which may be supplied to him along with fresh-cut sods. He should have the free use of salt, say, 3½ oz. a day in his food, or he may have in his manger, a lump of rock salt, to lick when he likes. If there be debility, give vegetable tonics, such as ½ drachm of nux vomica mixed through the food twice a day, or a quart of ale with 2 drachms of gentian or chiretta twice a day. If the action of the liver be suspected to be at fault, give daily in a ball a drachm and a half of powdered ipecacuanha for five or six days.

Medicine in this disease should be employed very sparingly. The horse should be warmly clothed, carefully exercised, and well groomed, so as to improve his general health. In winter, clipping the coat has often a good result.

When everything else fails to restore the horse to health, try the effect of a run at grass, not forgetting to allow him a supply of salt.

Constipation

is a symptom of various diseases, and may be due to natural tendency, constitutional weakness, paralysis of the bowels, folding or twisting of the intestines, the action of certain drugs, the presence of calculi (balls of earthy or undigested matter) in the intestines, obstruction of the bowel itself, errors of feeding, or of watering, etc. Horses which have not a plentiful supply of water are liable to obstruction, owing to the dung becoming of too solid a condition to be easily passed onward. We may, for convenience sake, limit the term " constipation," to retention of dung, generally, in the large intestine owing to its deficient action, to the practice of feeding horses on food which contains an excess of indigestible matter, and to improper methods of feeding and watering. This condition is known to doctors and veterinary surgeons as fæcal accumulation or coprostasis. The symptoms of this form of constipation, besides the stoppage in the passage of dung, are: distension of the abdomen with gas; mild and recurring attacks of colic; and sometimes more or less painful efforts at staling, owing to irritation of the bladder caused by pressure of the hardened mass of retained dung, on that organ. Death from this form of constipation is generally due to rupture of the intestine.

TREATMENT.—Constipation, when it is caused by improper food, rarely kills, even though no dung is passed for three weeks, or even longer, as has not unfrequently happened in cases which have, subsequently, made good recoveries. This fact should teach us to exercise patience when treating this condition. Human beings have been known to live for six months without going to stool. A horse usually dungs 8 or 10 times a day.

Strong purgatives, such as aloes or eserine, may, if given, cause rupture of the intestine and consequent death, by producing a copious watery discharge which is not able to force a passage in a natural manner, by the removal of the impacted matter.

If colicky pains are present, with a hard pulse, a purgative should on no account be given; for such a condition indicates a tendency to inflammation. The administration of belladonna and enemas of water will then be appropriate. If the pulse is soft, a gentle purgative, for instance, a quart bottle of linseed oil, may be given.

In constipation owing to errors of feeding, we should starve the animal, give a pint and a half of linseed oil, two or three times, back rake once or twice, and give two or three enemas of as much cold water as the bowel will take. The enemas should be admini-

stered while the hind quarters are raised, as recommended by Mr. J. G. Rutherford (p. 423). If the belly be distended with gas, give 2 oz. of turpentine with the oil. The animal should be moderately exercised, provided he be not troubled with flatulency. If these measures do not produce the desired effect, give 2 drachms of belladonna in a ball, or made up into a soft mass with treacle, and placed between the horse's back teeth, so that he may gradually swallow it. The amount of belladonna can be increased to 3 or 4 drachms in urgent cases accompanied by pain. The belladonna can be repeated in half its previous amount, after a few hours, if necessary.

Belladonna increases the worm-like motion of the bowels, without causing a watery discharge into them, and also allays pain. It is specially indicated, if the constipation is accompanied by colicky pains. The linseed oil is useful in softening and lubricating the undigested mass of food. The turpentine checks the evolution of gas, and also increases the action of the bowels. Ample time should be allowed for these drugs to act. Opium should on no account be employed; as it checks the action of the intestines. In human practice, good results are often obtained by an enema of about a drachm of glycerine, which, however, has only a local effect in clearing out the rectum. "Glycerine undiluted irritates the mucous membrane and even the skin by abstracting water. Hence its laxative effect" (*Finlay Dun*). Half a pint of it may be given as an enema by means of a catheter. An enema of 1 gallon of warm soap and water, ½ pint of castor oil and 1 pint of glycerine has been recommended when the rectum is filled with hard dung (rectal impaction).

No harm can be done by keeping the horse for ten days or a fortnight on nothing but water and molasses (say, 3-lbs. daily), which are not only nutritious and very digestible, but also have a laxative effect. Allowing him, on the contrary, an amount of solid food which would be moderate at other times, might fatally complicate matters during an attack of constipation. Many instances are on record of horses living for over three weeks on nothing but water.

The absence of intestinal rumbling or murmurs, which may be heard in the healthy horse, on applying the ear to the side of the belly, is the characteristic symptom of paralysis of the bowels. "Another may be mentioned of not unfrequent occurrence, especially if the paralysis be in the lower intestines, namely, a dilated, dry, and non-contractile condition of the rectum, which feels, when the hand is introduced, as a large cavity with passive walls" (*Williams*). The condition of paralysis may be overcome by giving a drachm of nux vomica twice a day, as well as the linseed oil.

Lampas

is a swollen condition of the palate, which, when thus affected, projects below the level of the upper front teeth. It is usually met with in young animals, as a consequence of the large supply of blood which is present for the growth of the teeth. It may be caused, in horses of any age, by cold, indigestion, etc. As lampas, except when it occurs from teething, is merely a symptom of derangement of health, the part should not, as a rule, be interfered with in any way; a couple of bran mashes, with ½ oz. of nitre in each of them, or 4 oz. of Epsom salts daily for a few days, being all that is generally necessary. If, from congestion of the gums during teething, the horse "quids" his food, and it is not convenient to put him out of work for a few days, the palate may be lightly scored with a lancet or penknife—care being taken not to wound the artery which lies underneath—and then rubbed with common salt. Bathing the part with a strong solution of alum and water will generally be sufficient, without lancing it.

Choking.

This term applies to obstruction of the gullet as well as to that of the windpipe.

Choking is usually caused by the horse ravenously swallowing a quantity of dry food, which becomes impacted in his gullet; or by pieces of carrots or other roots, eggs (given by the groom with the idea of improving the condition), or hard physic balls, sticking in the gullet. It is not uncommon for draught horses to become choked on being started off when they have food in their mouths. In this case, the windpipe becomes pressed between the collar and the bolus of food in the gullet. Sometimes the horse becomes choked in draught, on account of too small a collar compressing the windpipe. The same thing may happen when casting an animal with ropes. The necessary precautions are too obvious for detail.

Although obstruction of the windpipe will kill in three or four minutes, that of the gullet may not prove fatal for several days. I saw an instance of choking that became spontaneously relieved after ninety-six hours of complete obstruction, during which time any food or drink taken was returned through the nostrils; the cause of obstruction being a physic ball. The destructive changes set up by the presence of the ball for such a long period in the gullet, caused the death of the animal in about three months' time.

As the gullet is immediately above the windpipe for about half-way down the neck, and then takes its place on the left of the windpipe till it enters the chest; we should stand on the left of the animal when we want to see if anything goes down the gullet. This tube becomes a little narrowed near its entrance into the stomach.

SYMPTOMS OF OBSTRUCTION OF THE GULLET.—Very anxious expression of face and great distress. Nose generally poked out, and neck more or less stiff. Flow of saliva from the mouth. Inability, more or less complete, to swallow. Fluids returned through the nostrils, and sometimes through the mouth. If grass be chewed, the discharge from the nostrils will, during that time, be green-coloured. Attempts at vomiting. Continued distension of the gullet is an unerring sign of obstruction, and, when present, will be seen chiefly on the left side.

TREATMENT.—No time should be lost in attempting to remove the obstruction; for the continued presence of the foreign body may give rise to serious complications, such as sloughing of the mucous membrane at the seat of impaction, and inflammation of the lungs from the entrance of fluid and other matters into the windpipe. If the offending substance be within reach, it should be removed by the hand; while an assistant presses it forward with his fingers. If it be too far down for this to be done, it may be "started" by gently manipulating the gullet. When an egg sticks fast, it can be readily broken by pressure, if a stout needle be first of all run through it from the outside. In the case of obstruction due to dry food, it is well to give a few drenches of oil and water, while allowing the animal full liberty to return the fluid, which will assist in removing the obstruction. In administering drenches with this object, we must remember that they are apt to "go the wrong way," and thus give rise to pneumonia. If practicable, we should, as advised by McGavin, pass the point of a fine syringe (intra-tracheal or hypodermic) into the impacted mass, and try to break it up by injecting into it oil or water. We should let the patient have a constant supply of linseed tea or water to sip, and to return through his nostrils if he likes. If the horse is quiet, we may twitch him, and then pass a probang through his mouth into his gullet, so as to overcome the stoppage; great care being taken not to shove the probang into the windpipe. In default of a regular probang, we can use a male catheter, a flexible driving whip with a soft round head, fixed on to its point, or even a piece of rope "served" round with twine to make it stiff and smooth. If the animal is difficult to handle, he may be

"cast" and put under the influence of chloroform. If the cause of the obstruction can be felt from the outside, and if it resists all other efforts for its dislodgement, it should be cut down upon and removed. The chief points to be observed in performing this operation, which is one that requires knowledge and skill to do properly, are as follows:—(1) Carefully note, so as to avoid injuring them, the respective positions of the jugular vein and carotid artery. That of the former may be found by pressure with the finger (p. 118); that of the latter, by its pulsation. (2) Make the incision on the left side of the neck and a little below the obstruction, along the course of the gullet and below the jugular vein, so as to obtain effective drainage. (3) Make the wound no larger than is required for the object in view; refrain from pulling the gullet about; and having made the incision through the skin and superficial muscles, expose the part of the gullet we wish to cut down upon, by carefully tearing away the loose tissue with the fingers, so as to avoid bleeding. (4) Close the wound in the gullet with sutures (catgut for preference, p. 73), after bringing the divided muscular edges together, as well as the mucous ones; for union will not take place between mucous surfaces. (5) Treat the wound antiseptically (p. 70). (6) Keep the animal without food as long as practicable, until the wound has healed, which it will probably do in about ten days. Wounds in the gullet should be avoided if possible; for they do not as a rule heal well. After relieving a case of choking, the animal should be given only sloppy food, so as to allow the irritated mucous membrane of the gullet to regain its healthy condition.

Food and drink in the form of brown (Demerara) sugar and water can be advantageously given by the rectum (p. 632). When food has to be given by the mouth, it should be in a sloppy condition, so as to irritate as little as possible the mucous membrane of the mouth.

Prolapse of the Rectum.

In mild cases, this accident consists of the protrusion from the anus of mucous membrane, which, on becoming inflamed and infiltrated, may present a rounded mass of about a foot broad, with a depression in its centre. In some cases, the bowel itself comes down.

It may come on from straining due to colic, constipation, foaling, or sexual excitement, or from paralysis.

TREATMENT.—Remove any impacted dung, and endeavour, by steady pressure, to replace the part after having anointed it freely

with oil. If this does not succeed, scarify the mucous membrane freely with a lancet, and encourage the bleeding by the application of warm water, and, when the swelling has gone down, again attempt to replace the part. Keep the animal for some days on soft food, in which a pint of linseed oil may be given daily with advantage. West's Uterine and Anal Clamp, made by Huish, is a very useful instrument in these cases.

Calculi and Concretions.

NATURE.—In the bowels of the horse, especially in the large intestine, and very rarely in the stomach, are sometimes found balls of undigested material, which occasionally may attain to a

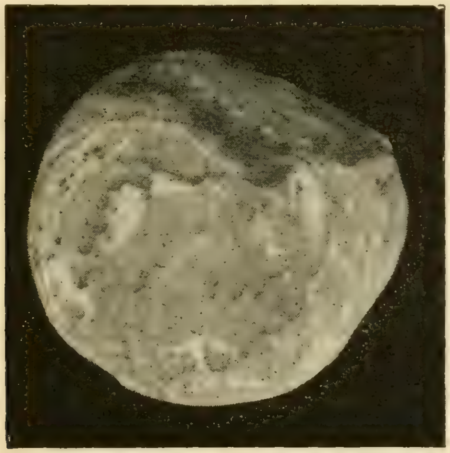


Fig. 143.—Phosphatic calculus.

diameter of five or six inches, or even more. As they become larger and larger, they usually cause death eventually from obstruction and pain. They are of three varieties. (1) Phosphatic calculi (Fig. 143), which looks like rounded and polished stones, and are chiefly composed of phosphate of magnesia and lime. They are of a much greater specific gravity than the other two kinds. An ordinary weight for these calculi is 2 or 3 lbs.; although they may, in exceptional cases, be as heavy as 16 lbs., or even more. The term "calculus" (*calx*, chalk) should, correctly speaking, be restricted to this variety; and the other two might be called "concretions." When a phosphatic calculus is found in the stomach, we may feel certain that it has been passed into that organ from the intestines; because the acid nature of the gastric juice would prevent its formation in the stomach. (2) Oat-hair

calculi or dust-balls (Fig. 144), which are formed of closely packed, undigested, vegetable matter. (3) Mixed calculi, which are made up of earthy and vegetable constituents.

Phosphatic calculi seem invariably to have been formed round some indigestible object, such as a piece of metal or fragment of stone which acts as a nucleus. Although not so apparent as in the phosphatic kind, it is probable that a nucleus generally exists in dust-balls and mixed calculi.

CAUSES.—Experience amply proves that the presence, in the horse's food, of indigestible particles, especially if they be of an irritating nature, is a fertile cause of calculus. The frequency of this complaint in the stables of many large firms, has been greatly diminished by the adoption of means for the removal of such possible nuclei. One of the best preventives is the use of an automatic separator provided with magnets, which attract and thus remove all particles of iron and steel from the corn passed over them. In small stables, the careful use of a sieve is imperative. Mr. Rogerson has pointed out that in foreign corn, among other sources of danger, are to be found great numbers of nails and heads of nails which are employed to tack down the canvas that lines the holds of vessels which carry corn in bulk. We may surmise that the presence of such an object set up, in the first instance, irritation of the mucous membrane of the bowel, with the result of its becoming surrounded with mucus, to which other undigested objects, passing by, would be liable to adhere. Or the irritation might cause the precipitation from the dissolved food of earthy salts. I think we may safely say that the tendency to calculus depends on the fact of indigestible and irritating substances being taken into the stomach. Mr. Hunting mentions that the indiarubber ring of a mineral water bottle formed the nucleus of a calculus which he examined on one occasion.

I have shown in "Stable Management and Exercise" that dry bran is an admirable food for horses, and that it is much more digestible than oats. I have already said that wet bran (bran mash) is more a medicine (a laxative) than a food.

From an examination of a phosphatic calculus, we cannot help being struck by the fact that the deposition of its earthy constituents must have taken place from a fluid which had held them in solution. We may therefore regard consumption of food rich in phosphates (like bran and maize) to be a predisposing, though not an exciting cause. Another predisposing cause might be a condition of the digestion, in which these earthy salts would be more liable to be deposited from the alimentary fluid, than in a state of health.

"True intestinal calculi consist principally of a deposit of an ammonio-magnesium phosphate (90 per cent. according to Fürstenberg) with which are found phosphate of lime, phosphate of magnesia, silica, certain chlorides, and traces of iron and organic matter (mucus, epithelium and alimentary substances). They are formed from the phosphate of magnesia of the bran, which is rich in it. This phosphate of magnesia unites with the ammoniacal compounds which exist in the contents of the bowels. These compounds are derived from the atmosphere of the stable, and are introduced into the digestive tube along with the drinking water. An insoluble basic-phosphate is thus formed in the intestines. The starting-point of the precipitation is generally a foreign body, such as a grain of sand or an oat, around which layers of basic phosphate are continually deposited" (*Friedberger and Fröhner*). The foregoing remarks on the formation of a calculus naturally suggest the inference that the more loaded with ammonia the air of a stable is, the more likely will calculi be formed in the intestines of horses living in such a stable. Bearing on this subject, there are two facts which deserve notice. First: Continental veterinary authorities are unanimous in saying that the feeding of horses on bran is a fertile cause of calculi in the intestines of such animals. Second: For the last thirty-five years I have fed horses on bran combined with oats or other grain, and have known thousands of other horses

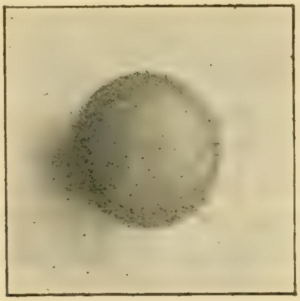


Fig. 144.—Dust ball.

similarly fed; but have not met with a single case of calculus from such regimen, which was given, however, under good sanitary conditions. I therefore conclude that there is no danger of intestinal calculi from feeding horses on bran, if the air of the stable is practically free from ammonia.

There is some evidence to show that forage which contains a quantity of the hairs and husks of oats, or meal dust, is apt to give rise to intestinal concretions, which are hardly ever found among animals whose food is carefully looked after.

An oat-hair concretion would appear to result chiefly from the mechanical adherence of undigested particles of food to the moist covering of a nucleus whose presence on the mucous membrane had caused a certain amount of irritation. The formation of a mixed calculus would probably be effected both by chemical and mechanical agencies.

An unhealthy condition of the intestines is not seen as a rule at *post-mortem* examinations of horses affected with calculus, and, therefore, it cannot be regarded as a cause of this complaint.

SYMPTOMS.—There is no characteristic symptom by which we can tell the presence of a calculus in the digestive canal; although there are several which are common to the disturbance brought about by it, and to other disorders. The only certain means—which is not always within our power to put in practice—by which we can determine the existence of such a body in the abdomen, is feeling it, which we can generally best do by introducing the hand into the rectum. These balls may attain a large size without causing death, or even without giving rise to any marked symptoms of ill-health, in which case we may infer that they continue to remain in some portion of the intestine, where, owing to the large diameter of the gut, or to the fact of their having made for themselves a pocket in it, they do not cause obstruction to the passage of food, until they become greatly increased in bulk. If, however, they happen to become dislodged, as for instance, by the action of a purgative, they may, very possibly, set up fatal obstruction by becoming wedged in some narrower portion of the large intestine, which varies greatly in size along its course. It appears that calculi cause colic far more frequently by the fact of their shifting, than by their being large. The ordinary (though by no means characteristic) symptoms of the presence of calculus are: frequent attacks of colic from no other ostensible cause; pawing with the fore feet from evident abdominal trouble; resting the hind quarters against some support, as a wall, for instance; and sitting on the haunches like a dog. Dick remarks that: "in an advanced stage, no doubt can remain as to the nature of the disorder. The countenance is haggard, the eye distressed, the back up, the belly distended, the respiration becomes hurried, bowels habitually costive." The habit of seeking relief by resting the hind quarters against some support, is also seen in impaction of the bowels by undigested food. Often in fatal cases, there is continued pain for two or three weeks, or even more, before death.

TREATMENT.—If the presence of a calculus be suspected, the arm should be passed into the rectum with the object of removing any of these balls which may be in reach. Dick recommends giving strong purgatives and large enemas with the view of clearing away the obstruction. Although a strong purgative might hasten death by dislodging a calculus which had, up to the time being, caused no inconvenience; the fact remains that it often brings away calculi, the presence of which in the intestines had been unsuspected.

CHAPTER XXI.

Diseases of the Urinary Organs.

GENERAL REMARKS—RETENTION OF URINE—BLOODY URINE—INFLAMMATION OF THE BLADDER—ALBUMINOUS URINE—INFLAMMATION OF THE KIDNEYS—STONE IN THE BLADDER.

General Remarks.

The exact nature of diseases of the urinary organs is often difficult to determine; for unusual conditions of the urine and symptoms of disease of these organs may be present, without anything being wrong with them, as we may see in hæmoglobinuria, diabetes, and constipation. To correctly investigate these diseases, one should be able to analyse urine, to do which, a knowledge of chemistry and microscopy is necessary. I shall therefore only briefly refer to these diseases, which, happily, are rare in the horse, except in the case of retention of urine as an accompaniment of colic.

The kidneys (Fig. 141, p. 351), two in number, are the glands which form urine from the blood. As the urine is secreted, it is carried away from the kidneys into the bladder by the ureters, which are narrow tubes, and is finally got rid of by means of the urethra, which is a comparatively large tube that connects the bladder with the penis of the horse and with the vagina of the mare; expulsion being effected by the contraction of the muscles which surround the bladder.

Retention of Urine

is a symptom of disease rather than a disease in itself. It is generally caused by spasm of the neck of the bladder; by paralysis of the bladder; by the accumulation of hardened soapy matter in the sheath, owing to neglect of cleanliness; by the horse having been kept too long from staling; by impaction of the rectum

with hard dung; and by chill. It may also be due to the presence of stone in the bladder or urethra (the canal by which the urine escapes), and to other causes affecting these parts. It may accompany colic and other diseases. Although in colic there may be retention; still, when suffering from it, the animal does not make such frequent attempts to stale, as he does when attacked by the ailment under consideration.

The chief manifestations of retention of urine when it exists to such an extent as to be a diseased condition, are distension of the bladder, and *strangury*, which is the term applied to the state in which a horse is when he makes frequent, urgent, painful, and more or less ineffectual attempts to stale, while adopting the stretched-out position characteristic, in horses, of that act. The distended condition of the bladder may be felt, if the hand is passed into the rectum.

TREATMENT.—Foment the loins; give an enema of warm water in which $\frac{1}{2}$ oz. of opium has been boiled; clothe warmly; give a pint of linseed oil; and after that the following ball:—

Opium...	$1\frac{1}{2}$ drachm.
Camphor	$2\frac{1}{2}$,,

Repeat the ball, if, after an hour or two, the horse has not staled. If the symptoms are urgent; or if the foregoing measures do not succeed, pass a catheter (p. 655); or exert pressure on the bladder with the hand in the rectum, in the event of the bladder being paralysed. If spasm of the urethra prevents the passage of the catheter, it is well to adopt Veterinary Surgeon Desmond's procedure of blowing air with the mouth through the catheter, so that the expired air will overcome the spasm, in which case the horse will expel urine along with the air. Oiling the head of the penis and inside of the sheath will facilitate urination, by disposing the penis to come down. To counteract spasm of the neck of the bladder, we may stimulate the skin outside it (just below the anus) by rubbing turpentine into it. When the animal has staled, give linseed mashes and linseed tea.

Bloody Urine.

The dark or bloody colour assumed by the urine is, usually, caused by improper feeding, or by strains received during violent exertion. I knew a steeplechase horse that was always more or less affected in this manner after a race. Disease of the kidneys, irritation of the urinary passages, and the presence of calculi, are

also causes of bloody urine, which we must be careful to distinguish from the condition of the blood in hæmoglobinuria (p. 520).

TREATMENT.—Put the horse on cooling food. Give linseed mashes, and substitute linseed tea for water as his drink. Give a mild dose of aloes and one drachm of strong tincture of iron (p. 613) in water twice a day for a fortnight. In India, a decoction of the leaves of the *sissoo* or *seesum* tree is a favourite native remedy. About half a bucketful of the leaves is taken, water is poured over them, they are mashed up between the hands, and are allowed to soak in the water for nine or ten hours; the fluid should be then strained off and given to the horse to drink. The mixture of a couple of handfuls of unrefined sugar (termed *goor* in Hindustanee) will make this drink palatable to him. This mucilaginous fluid acts as an emollient in soothing irritation.

The rationale of the foregoing treatment is as follows:—The purgative is given to draw the blood away from the inflamed urinary passages; the strong tincture of the perchloride of iron acts as an astringent in causing contraction of the congested blood-vessels of the affected part, and thereby checks the flow of blood; and the linseed and sissoo are soothing agents.

If the urine be very dark-coloured without the presence of blood, we may generally conclude that this condition is due to too high feeding. The treatment should be a full dose of physic (aloes); cooling diet in very small quantities; and $\frac{3}{4}$ oz. of nitre daily in the food or water. As the injurious substances which accumulate in the blood from too high feeding, are gradually got rid of along with the urine; we give nitre in order to stimulate the kidneys to remove them as quickly as possible out of the system.

Inflammation of the Bladder.

It is probable that the only causes of this disease are the absorption into the system—by internal administration or external application—of irritating poisons, such as cantharides or croton; the excretion of noxious matters from the blood; and injury. Fatal consequences have, sometimes, occurred from blistering "all round." In warm weather, the urinary organs are more liable to become affected by blisters than when the temperature of the air is low. The chief reason for this is, I think, that in summer, owing to the increased action of the skin, less urine is secreted, and, consequently, the irritating matter, being less diluted, cannot be removed from the bladder as quickly as when the amount of urine is abundant, as in cold weather. Besides, the higher the temperature of the air, the more rapidly do the absorbents take up the active principle of the blister.

Mares, at certain seasons, owing to sexual causes, are specially liable to this affection from blisters.

SYMPTOMS.—The lining membrane of the mouth—as well as that of the whole intestinal canal—becomes red and inflamed. In stallions and mares there is sexual excitement. "The urine is voided frequently, and with difficulty and pain, as it is irritating and burning; it is highly albuminous; the fæces are covered with mucus and mixed with blood" *(Gamgee).*

There is fever, pain, and excitement. The urine contains mucus, with or without blood. If the symptoms be not alleviated, the disease will generally run a fatal course in two or three days.

TREATMENT.—If the disease results from a blister, wash the blistered part with warm water which has some carbonate of potash dissolved in it. Give the horse linseed tea to drink, and put him on bran mashes. If he will eat, mix two ounces of the bicarbonate of soda in the food daily, or divide them between two or three drenches. Give the whites of a couple of dozen raw eggs, now and then. Administer in a ball, three drachms of camphor twice a day. If there be great pain, give once or twice in the day, two drachms of the extract of belladonna in a ball, or, having previously made it into a soft mass with treacle and linseed meal, place it between the back teeth to gradually dissolve.

PRINCIPLES OF TREATMENT.—Both the bicarbonate of soda and the linseed tea have a soothing effect on the mucous membrane, and the sedative influence of camphor is well marked in cases of irritation of the urinary organs. The belladonna acts as a sedative to these organs by causing contraction of the blood-vessels of the part, and, thereby, tends to reduce the inflammation. It is a powerful sedative. The carbonate of potash forms a soap with the oily matter of any portion of the blister which may have remained on the spot, and thus aids in removing it. The white of egg gives protection against the irritating action of the absorbed cantharides.

Albuminous Urine.

The existence of albumin in the urine generally arises from causes unconnected with actual disorder of the urinary organs, and is in no way inconsistent with health. Albumin is often found in the urine after hard work; and also during fatty degeneration of the kidneys—a very rare and intractable complaint among horses—the symptoms of which are: stiffness in movement; and the continued practice by the affected animal of standing stretched out in his stall, as if he were about to stale.

To test for albumin in the urine, put a small quantity of the fluid into a test-tube, add a few drops of acetic acid, or vinegar, to neutralise it (as albumin is soluble by an alkali), and boil the fluid over a lamp. If albumin be present,

a coagulum will be formed, which will remain unchanged on the addition of nitric acid, but will be dissolved by liquor ammoniæ. In making this experiment we should remember that a very small excess of the acetic acid may prevent the albumin from coagulating. If there be but little albumin present, the precipitate will not appear until the urine boils; if much, it will show itself before boiling point be reached. Another method is to "charge a test-tube to a depth of ½ or ¾ inch with strong nitric acid, and then pour a small quantity of urine slowly down the side of the inclined plane, so that it may rest on the acid without mixing with it. If albumin be present, an opaque white cloud, disc-like in form, immediately appears in the plane of contact of the two fluids" (*Bristowe*).

Inflammation of the Kidneys

is fortunately a very rare disease in the horse; for it is dangerous to life, and we know but little about it. It may be acute or chronic. Probably its usual causes are chill, and irritation to the kidneys by poisons, and by the products of certain bacteria (p. 448), such as those of glanders and pneumonia. The chief symptoms are: diminution of urine; strangury (p. 442); colic; arching of the back; continued standing; stiff and straddling gait; intolerance of pressure on the loins; and weakness. In fatal cases, there are head symptoms shown by unconsciousness and spasms. One of the most distinctive signs of this disease is the presence of "casts" in the urine. These casts of varying structure form in the minute (uriniferous) tubes which convey away the urine from the kidneys, and which, as a rule, are from $\frac{1}{500}$th to $\frac{1}{1000}$th of an inch in diameter. For information about the nature of these casts and the methods of their examination, I must refer my readers to special books on pathology.

TREATMENT.—When the disease proceeds from chill, harmful matters in the food, or poisons, we should foment the loins, and give 1 lb. of Epsom salts in a quart of water, and 1½ oz. of laudanum in water two or three times a day if required. Linseed tea will be a useful substitute for drinking water. The animal should be kept at rest and warmly clothed and stabled.

By fomenting the loins, keeping the surface of the body warm, and giving a purgative, we diminish the inflamed condition of the kidneys. As the kidneys excrete waste nitrogenous matter from the system, the more exercise the horse takes, the more work will his kidneys have to do.

When inflammation is secondary to other diseases, they, not it, should be treated.

Stone in the Bladder.

The horse, like man, may be affected with calculi (stones) in the kidneys, ureters, bladder, or urethra. These calculi are, as a rule,

largely composed of carbonate of lime, which is always to be found in the urine; hence, the presence of stone in the positions just mentioned, and the danger of keeping horses from staling for prolonged periods. For the same reason, when a horse is in his stall, with the bedding "up," he should always have some straw under him, on which to stale; and when he is kept for a long time at work, as when out hunting, or on a journey, he should be given full opportunities to do so, especially, on grass, so that he may not splash his legs, the fear of doing which, often causes him to refrain from micturating longer than he ought to do. These calculi vary in bulk from fine sand to a mass the size of a man's fist, or even larger; and may be of a hard nature, or of the consistence of soft mortar, which, if remedial means be not used, may almost entirely fill the bladder. The calculus, when of a solid consistence, is generally grey in colour, smooth, more or less round, easily broken, and arranged in concentric layers or strata (Fig. 145), which appear respectively to have been deposited from the urine round a nucleus during certain well-defined periods of activity.

The SYMPTOMS are severe colicky pains which recur more or less frequently; straining and repeated efforts to stale; inability to retain urine; interruption to the flow of urine; presence of blood in the urine; stiffness of gait of the hind limbs and whisking of the tail. The presence of stone may be discovered by an examination *per* rectum.

TREATMENT.—The only effective treatment is removal of the stone or deposit. For doing this in the horse, there are two ways, which differ slightly from each other. According to the French method, described in Peuch and Toussaint's book on "Veterinary Surgery," the patient is secured, while standing up, by placing a short pair of hobbles on his hind pasterns, passing a rope from the hobbles, between his fore legs, across his breast, over his withers, down his side, and round itself to the hand of an assistant. The animal will now be unable to kick anyone standing immediately behind him. A twitch may also be applied for obtaining increased control. An assistant, standing on the near side of the horse, will introduce his hand into the sheath, seize the penis, draw it out, and insert into the urethra the nozzle of a large syringe filled with tepid (say, about 95° F.) water, which a second assistant will inject into that canal, so as to make it stand out to about the thickness of a finger directly below the anus. A vertical incision of about $1\frac{1}{2}$ inches is made into the urethra, just below the prominence of the anus, at the point where the urethra makes

a bend forward, so as to enter the bladder. In making this incision, great care should be taken to keep to the middle line of the urethra, so as to avoid wounding either of the arteries (the internal pudic), or injuring any part of the urethra except that in which the cut has to be made. A special kind of forceps is introduced through the opening into the bladder to catch hold of and remove the stone. A capable assistant should pass his hand into the rectum and aid the operator by directing the stone towards the claws of the forceps. The precautions to be adopted

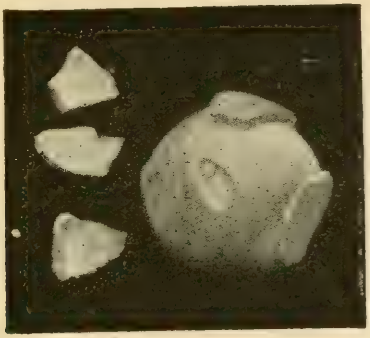


Fig. 145.—Urinary calculus.

while performing this not very difficult operation, are fully described in the French work from which I have compiled the foregoing particulars. English veterinary surgeons, instead of filling the urethra with water, usually pass a catheter, and make the opening by cutting down upon it. They also, as a rule, perform the operation with the horse placed on his back on the ground. When the deposit is in the form of a soft mass, it will have to be removed by a specially made spoon.

In the mare, the stone can be removed, without the use of the knife, through the urethra, which is larger than that of the horse, and which opens on the floor of the vagina, at about 4 inches from the outside. The opening of the female urethra into the vagina, is guarded by a valve, which points to the rear and which can be easily lifted up with the finger.

CHAPTER XXII.

General Diseases.

GENERAL REMARKS—SIMPLE FEVER—STABLE FEVER—MALARIAL FEVER—SURRA—TSETSE FLY DISEASE—INFLUENZA—CONTAGIOUS PLEURO-PNEUMONIA — STRANGLES — ANTHRAX — SOUTH AFRICAN HORSE SICKNESS—PORT PIRIE HORSE DISEASE—CEREBRO-SPINAL FEVER—GLANDERS AND FARCY—EPIZOOTIC LYMPHANGITIS—ULCERATIVE LYMPHANGITIS—WEED—TUBERCULOSIS—DOURINE—HORSE-POX—DIABETES MELLITUS—DIABETES INSIPIDUS—PURPURA HÆMORRHAGICA — HÆMOGLOBINURIA — RHEUMATISM — RABIES —TETANUS—BLOOD-POISONING—NAVEL-STRING INFECTION.

General Remarks.

We may safely conclude that all the general diseases which are of an infective nature, are caused by the entrance into the system of minute vegetable or animal organisms. As a rule, the former are bacteria (pp. 19 and 63); and the latter, parasites which live in the blood (hæmatozoa). The specific parts played by different kinds of bacteria are of great variety. Some bacteria produce colour, as, for instance, a blue tinge in milk; others, light, as we may see by the phosphorescence produced by the *photo-bacterium phosphorescens* during the fermentation of sugar, under certain conditions. They are the causes of fermentation and putrefaction, and, in many cases, of disease. Various kinds of fermentation-producing bacteria are essential to the proper performance of digestion. In plant life, bacteria are the means by which lucerne and many other vegetables absorb nitrogen from the air. Dr. Patrick Manson (Gibson's "Text-book of Medicine") tells us that "disease-producing organisms elaborate poisonous substances, which call forth certain symptoms, of which some are specific, and belong exclusively to a particular species, while others are general, and shared by many organisms. Poisonous substance obtained from a tetanus culture, for instance, which, when injected into an animal, produces tetanus, is a specific poison;

other poisonous substances, which merely produce fever and other general symptoms, are not specific, and may be found in many other organisms. It is a matter of the greatest importance to keep in mind this twofold nature of the poisonous substances of disease-producing organisms." The substances which produce high internal temperature (fever), perform their office by their action on the heat centres of the nervous system, and are not necessarily products of organisms which give rise to special diseases. It is obvious that we should regard fever as a symptom, and not as a disease.

In some cases, as in malaria, the microbes of a disease produce their harmful effect, chiefly by their direct action on the system.

GENERAL TREATMENT.—Here, our objects are: (1) To check the action of any disease germs that may be in the body, by giving antiseptics, such as quinine, arsenic, salicylic acid, nitre, and salt; (2) to stimulate the skin and other excretory organs, so as to get rid of the waste products of tissue change, the retension of which would tend to poison the system; (3) to allay distressing symptoms; (4) to keep up the strength.

The action of antiseptics in these diseases appears to be as follows: On being absorbed into the blood, they check the development of disease germs, and the manufacture of ferments and specific poisons (toxins, p. 19) in the same manner as they would do in the case of ordinary blue mould in a liquid in which they were dissolved.

Simple Fever

is a condition of the body in which the internal temperature is higher than natural. It usually runs its course in a week or less.

The SYMPTOMS are: increased internal temperature; frequent pulse; quickened breathing; dulness; and loss of appetite.

The CHIEF CAUSES are: exposure to heat; exhaustion from violent and prolonged exertion; nervous shock; the influence of unhealthy surroundings; and infection by bacteria which produce substances that act on the heat centres, but do not give rise to special diseases.

Although simple fever is rare in England, it frequently occurs in India and other tropical countries, the usual causes being exposure to the sun and imperfect ventilation of the stable during hot weather, especially, when the animals are highly-fed and but little worked. Well-bred horses, and those of dark colour, resist the effects of the sun far better than those of a coarse breed or of a grey or white coat.

TREATMENT.—If possible, remove the animal to some healthy situation, if the sanitary conditions of his abode are defective. Nurse him carefully; allow him soft food to eat, and an unlimited

amount of cold water to drink. Give him the following draught three times a day for two or three days:—

Nitre	3 drachms.
Sweet spirits of nitre	1 oz.
Cold water	1 pint.

If the sweet spirits of nitre be not at hand, give daily $\frac{3}{4}$ oz. of nitre dissolved in the drinking water. If constipation be present, back-rake, administer an enema, and give $\frac{1}{2}$ lb. of Epsom salts in water as a drench.

If the skin feels dry and hot, sponge it over with vinegar and water from time to time. If there be great heat about the forehead and temples, cover them over with wet cloths.

In hot countries, care should be taken that a free current of air is maintained through the stall, and that the animal is well protected, by a thick roof overhead, from the direct rays of the sun. In India, if the weather be very sultry, a couple of men may be employed to keep the horse cool by means of large hand fans.

When the severity of the attack has subsided, the horse should be fed liberally; green meat, if possible, being freely supplied. If he shows much debility, he may have a couple of quarts of beer a day, or other suitable vegetable tonic. As these fever cases, in hot countries, are often complicated by derangement of the liver, no salt of iron should, as a rule, be employed in their treatment.

Stable Fever.

For convenience sake, I place under this heading the form of fever to which young horses are particularly liable when taken up from grass, or put into unsanitary stables, in most of which the virus of this fever seems to have a permanent abode. The great improvement in stable sanitation during late years, has been accompanied by a marked decrease in the frequency of this disease, and in that of equine influenza. I am strongly of opinion that this ailment is due to the entrance into the system of disease germs that find a rich and suitable soil in many of the dirty, crowded, and ill-ventilated stables which are to be met with in large towns. This view is strengthened by the fact that one or more previous attacks confer, to a certain extent, immunity from it. The better the sanitary conditions, the freer, as a rule, are stables from this complaint, which may be treated as simple fever, see preceding page.

Malarial Fever.

NATURE.—Formerly, malarial fever of man was regarded as a disease produced by the bad air of certain unhealthy localities, such as swampy ground in hot countries. Lavernan was the first to demonstrate the fact that the cause of this disease is a very low form of animal life (the plasmodium of Lavernan) which occurs in different forms, and which gains entrance into the body by means of mosquitoes of the genus *anopheles*, that act as their carriers. The malaria parasite is a protozoon, and not a plasmodium, which term, in this application, is incorrect, though sanctioned by use.

This parasite, in the form of very minute needle-shaped organisms, is injected into our blood along with the saliva of the mosquito, at the moment this fly bites our skin. Each of these spores (to adopt Professor Lankester's nomenclature) enters a red blood corpuscle, undergoes a stage of development (amœbula), and breaks up into numerous spherical spores (enhæmospores) which enter the blood by the destruction of the red corpuscle. They then envade and destroy fresh red corpuscles and by their continued multiplication, infect the whole of the blood. Other stages of development take place, until their final transformation in the blood is attained. They are then in a suitable state to be sucked up by mosquitoes, and after that takes place, they arrive in the stomach of their carrier, undergo changes and migrations, and at last gain access into the mosquito's salivary glands. They are then ready to make a new invasion. We thus see that these organisms are parasites of the mosquito, as well as of man; and that a human being who is suffering from malarial fever can infect the mosquitoes of a place which had hitherto been free from that disease. In this way, one human being can indirectly infect another human being. Direct infection from one man to another man can be communicated only by inoculation. Mosquitoes have their regular meals, just after sunrise and after sunset, which are consequently the times for specially avoiding these insects.

The constitutional disturbance is chiefly due to the destruction of the red corpuscles and to toxins elaborated by these parasites (Manson).

"Observations by Koch, confirmed by Stephens and Christophers, have recently shown that in intensely malarial districts, practically all the young children have malaria parasites in their blood. As the native children get older, their blood is progressively less liable to the infection, and in native adults the parasites are rarely found. Immunity from malaria can therefore be acquired" (*Manson*).

There are several forms of malarial fever, of which intermittent fever (ague) and remittant or continued fever are the most common. The researches of Majors Walter Reed and Gorgas and other observers show that a mosquito (*culex fasciatus*) is the transmitting agent of yellow fever.

Dr. Manson points out that the successive generations of the parasites of intermittent fever tend to become simultaneously mature in the blood of their human host, about the same time every day, every second day, or every third day, according to their species. Thus, those which live for 24 hours, produce quotidian (daily) fever; those which exist for 48 hours, tertian fever; and those whose cycle of development is 72 hours, quartan fever. I have not seen similar paroxysms and remissions in the malarial fevers of horses.

The bilious symptoms often seen in cases of malarial fever are chiefly due to the bile of the patient containing an abnormally large amount of *bilirubin*, which is the bile pigment that gives a yellow colour to the skin and other tissues in jaundice. As bilirubin is produced by the decomposition of hæmoglobin, it follows that the more free hæmoglobin there is in the blood, the greater will be the quantity of bilirubin in the bile. In malarial fever the blood becomes loaded with free hæmoglobin, owing to the destruction of red corpuscles by the malarial parasites.

The chief breeding places of mosquitoes are shallow pools which are not large enough to contain fish, and which do not dry up between showers. Hence, the best way to rid a district of mosquitoes is to drain or fill up these pools, or to destroy the mosquito larvæ by pouring into these pools a sufficient quantity of paraffin oil to cover their surface; and to kill all the mosquitoes within reach. A large number of the mosquitoes which infest houses, can generally be found resting on the walls in the interior of these buildings during the day.

Colonel A. H. Morris, who is in charge of the Northern Territories of the Gold Coast, reports: "I caused all holes which might contain puddles, and so become breeding-grounds for the anopheles mosquito, to be filled up. Some hollows in rocks, containing about 18 inches of water, were discovered filled with thousands of larvæ. The Hausas' and Carriers' lines were inspected twice a week in order to ensure no stagnant water being allowed to remain in old pots or tins. The general result has been an immense reduction in the number of mosquitoes."

Sir W. R. Kynsey ("The Lancet," 9th August, 1902) tells us that "in Havana, yellow fever was endemic for a century and a half. During the past year it has been freed from the scourge by killing the mosquitoes in the neighbourhood of each focus of disease as discovered, and by carefully disinfecting every house that had lodged a yellow-fever patient, in order to destroy the mosquitoes that had bitten a sick person."

The breaking up of ground for the construction of roads etc. in tropical countries, is often followed by outbursts of malarial fever, probably on account of the formation of pools of stagnant water.

OCCURRENCE AND SYMPTOMS.—For many years, veterinary surgeons have known that horses in certain feverish districts of India, such as Bengal and parts of the North-West, become occasionally affected with a low type of fever, in which there is great debility, with loss of appetite and condition. The pulse is feeble and oppressed, though usually without much acceleration. I have not observed any other signs of ill-health, except a rise in the internal temperature. A few years ago, Dr. Lingard found that this disease was caused by animalcula, closely allied to the producers of malarial fever in man. As a rule, it is not a serious disease, although cases now and then terminate fatally.

For a long time, a disease has been known in South Africa as "biliary fever," which was regarded by many as the biliary form of horse-sickness (p. 477). This supposition was ill-founded, because the percentage of mortality from it was small; it is as liable to affect horses in stables, as those at grass; and it is resident in localities where horse-sickness is unknown. Mr. D. Hutcheon, C.V.S., Cape Town, tells us ("Veterinary Record," 5th April, 1902), that "in the Cape Colony it is more prevalent in the Cape Peninsula, and along the East Coast, extending about 100 miles inland, than elsewhere, but its area of infection has been increasing, and cases are now met with all over the South African Colonies." Dr. Theiler was the first to observe micro-organisms in the blood of horses affected with this South African disease, and Mr. W. Robertson, M.R.C.V.S., in 1900, found in the red blood corpuscles of such animals, protozoa closely resembling those of human malarial

fever; hence this disease is nearly allied to Indian malarial fever. It is most prevalent during summer and autumn. "Imported horses are more subject to it than Colonial bred. Horses which are brought to the coast from the high inland districts, where the disease is rarely met with, are also more susceptible to an attack than those bred on the coast. I know of several farms where almost every strange horse which is brought there during the summer or autumn months contracts the disease. Horses are liable also to a second attack, but such horses in my experience have been removed from the infected centre subsequent to the first attack, and became reinfected on their return. Horses reared continuously on the same farm do not contract the disease a second time, and many horses, which are bred and reared on such farms, do not become visibly affected with the disease at all" (*Hutcheon*).

The disease is sudden in its attack. The horse is depressed, breathing and pulse quickened, and temperature very high. The loss of appetite is more or less dependent on the severity of the symptoms, but there is almost always considerable thirst. The lining membrane of the eyelids assumes a bright yellow colour, and the mucous membrane of the lips become tinged with yellow; hence the name of "biliary fever." The bowels are constipated, as a rule, and sometimes the animal suffers from colic. "Usually the fever lasts from four to seven days, although some cases may last much longer. In the great majority of cases that are properly attended to and recover, the temperature usually begins to fall on the third day, and the animal may be apparently all right by the sixth day. In fatal cases, the temperature remains high, the breathing becomes quicker and more distressing, and the general uneasiness greater until the end; death may take place from the fourth to the eighth day" (*Hutcheon*). We thus see that equine malarial fever resembles human malarial fever, as regards its acquired immunity and bilious symptoms, which appear to be the result of the breaking up of the red corpuscles by the malarial parasites.

Under the heading, "An Un-named Disease in South Africa," Mr. J. M. Lund, C.V.S., alludes apparently to South African malarial fever, when describing ("Vet. Record," 14th Sept., 1901) a disease which broke out in Mafeking during the hot weather, and which proved fatal in many cases. The chief symptoms were great depression, quick thin pulse, high temperature, and "yellowness of the visible mucous membranes, that of the eye being studded with large purple blotches." Mr. Hoggan, C.V.S. ("Vet. Record," 12th Oct., 1901), met at Kroonstad several similar cases, in which the purple blotches on the lining membrane of the eyelids was a well-marked symptom.

PRINCIPLES OF TREATMENT.—In treating this disease, we should use a mild purgative in order to clear the way for the action of the febrifuge, which should be some antiseptic, such as quinine, cinchonine, carbolic acid, or arsenic. Sulphate of quinine, though the most expensive, is undoubtedly the most useful agent. The antiseptic, whichever one is employed, should be given in large doses at first, and then gradually decreased; for if the opposite to this be done, we might unintentionally so accustom the germs, whose presence in the blood is the cause of the disease, to the action of the quinine, that the quinine might, to a considerable extent, lose its power of affecting them. Men in India who begin taking quinine in small doses for intermittent fever, frequently find that, after a time, it loses all power to check the disease.

" Quinine is destructive only to the mature forms, not to those intermediate. It ought, therefore, to be given during the attack, not in the intervals; as it is at the time of the attack that the plasmodia exist in the fully-developed condition" (*Hamilton*).

TREATMENT.—In treating the Indian variety, administer an enema (p. 632), and give 8 oz. of Epsom salts in a pint of water as a drench. After about twelve hours, give $\frac{1}{4}$ oz. of quinine in a pint of water twice a day for the first couple of days, and then gradually diminish it down to 1 drachm, by the end of a week, when it may be discontinued. Or we may give $1\frac{1}{2}$ drachms of carbolic acid in $\frac{1}{2}$ pint of linseed oil twice a day for three days. If linseed oil be used, Epsom salts can be dispensed with. Give 1 oz. of sweet spirits of nitre, in a pint of cold water, two or three times a day, as a drench, as well as the quinine or carbolic acid. The sweet spirits of nitre is a good stimulant, and tends to promote the removal of impurities from the blood by acting on the kidneys and skin. It may be given along with the quinine. Allow laxative food; obtain for the animal, if practicable, a change of air; and nurse him carefully. During the period of convalescence, the patient should be liberally fed, and may have an ounce of liquor arsenicalis mixed in his food daily for a week; and, also, a quart of beer two or three times a day

Respecting the South African form of malarial fever in horses, Mr. Hutcheon states that the following treatment "is invariably satisfactory, if properly carried out. Give at once:—

" Powdered chloride of ammonium ...	$\frac{1}{2}$ ounce.
" Extract of belladonna	$\frac{1}{2}$ drachm.
" Common mass, sufficient to make a ball.	

" If given as a draught, the ammonium chloride and belladonna

may be dissolved in a pint of warm water. This dose must be given at least three times a day, and continued. It is rare that it requires to be given after the second day. Six doses given at proper intervals are generally enough, but more may be necessary. Do not give purgative medicine, especially aloes, no matter how constipated the bowels are. Put a tablespoonful of sulphate of soda in the drinking water, twice a day, and give frequent injections of soap and warm water to assist in moving the bowels, but avoid purging. The bowels will begin to act as soon as recovery commences." Mr. Hutcheon also advises careful nursing, attention to sanitary rules, and green food.

Mr. Hoggan found the most successful treatment was a solution of ¼lb. Epsom salts and ½oz. of ammonium chloride (sal-ammoniac), given twice daily for two or three days, and followed by vegetable tonics.

Mr. Lund, after unsuccessfully trying many drugs, had extremely good results with the intra-venous injection (p. 636) of 2 grains of biniodide of mercury dissolved in water.

Surra (*Trypanosomatosis*).

DEFINITION AND CHARACTER.—Surra (*Hind.* rotten) is a specific fever which runs an alternating course of exacerbations (paroxysms) and intervals of comparative freedom from the symptoms; the former varying from about three to ten days according to the severity of the attack; the latter being somewhat shorter. The alternate occurrence of these paroxysms and intermissions is the chief feature of this disease. Up to the present, surra has been invariably fatal, except in favourable cases which have been treated according to Dr. Lingard's method (p. 459).

SYMPTOMS.—The two chief symptoms are progressive anæmia (poverty of blood), and high temperature (say, 105° F., with a variation of two or three degrees either way) during the exacerbations. Nariman remarks that the pulse is frequent and soft, and the breathing quick and so liable to become distressed from slight exertion, that such distress is often the first symptom which attracts the owner's notice. The mucous membranes become pale and subsequently yellow. The appetite generally is excessive and depraved, and grain is usually rejected for grass, of which large quantities are greedily consumed; in fact, Lingard points out that a ravenous appetite is almost always a characteristic symptom of surra. From the first, the animal is dull and his movements languid. There is great loss of condition and in-

creasing weakness, and a more or less continued flow of tears from the eyes. "Pain is evinced on pressure being made over the loins, and on each side of the sacrum [croup]. The breath in some cases is very offensive. There is continued sexual excitement in both sexes. Now and then, there are dropsical swellings of the legs. Occasionally, shallow ulcers appear on the gums, inside of the lips and tongue. Sometimes, very superficial ones appear inside the nostrils, as yellow scabs, for a day or two. Successive crops of blood-spots appear on the membranes of the eyes, and are characteristic of this disease; in that they are few, or even absent, when the parasites are active in the blood; and are well marked and numerous during the decline of the fever. These more or less purple blood-spots are due to the transudation of blood from the blood-vessels" (*Steel*). The blood, if drawn, will be found to be of an abnormally dark colour, which fact is due to the destruction of red corpuscles, the office of which is to carry oxygen for the purification of that fluid. In advanced cases, the cornea may become opaque, with a tendency to ulcerate. A yellow, semi-gelatinous exudation takes place in the loose tissue under the skin.

Steel noticed *post-mortem* in about two-thirds of his cases among mules in Burma, ulceration of the stomach, which was not brought on by the administration of drugs or irritating food, and which, according to Lingard, is a result of surra.

"The most common periods during treatment by arsenic in which the hæmatozoon re-appears in the circulation of equines whose systems are under the influence of the drug, is somewhere about the 25th, 50th, or 75th day of an intermission, *i.e.*, subsequent to the disappearance of the organism from the circulation of the animal. This gives one an idea of the deterrent effect produced on the immature form of the surra hæmatozoon, and its great tenacity of life; for in ordinary cases of the surra, the intermissions between the paroxysms, rarely if ever exceed a maximum duration of seven days" (*Lingard*).

POST-MORTEM APPEARANCES.—As a rule, there is great emaciation; enlargement of the liver and spleen; blood-spots (petechiæ) on various internal organs; and a deposit of a yellow or amber-coloured jelly or jelly-like fluid under the skin of the throat, chest, and abdomen, about the muscles and other tissues, and especially round the base of the heart. The lungs often show signs of inflammation. The mucous membranes and other tissues are frequently tinged yellow, on account of the breaking up of red corpuscles of the blood, by the surra parasites (p. 451). "I am of opinion that in all cases of death from chronic surra, or in animals which have been destroyed after the disease has been in existence

for some time, that ulceration of the stomach, more or less extensive, will be seen *post-mortem*" (*Lingard*).

NATURE OF THE DISEASE.—Surra is due to the presence, in the blood, of a microbe (*Trypanosoma Evansi*), which belongs to the animal kingdom, and which lives and breeds in that fluid. This parasite always exist in the blood of surra-affected horses during the frequently recurring feverish periods (say, when the temperature is 103° F. or over); and surra will always ensue after inoculation with blood containing it. These minute infusoria (*Trypanosomata*) may, during an exacerbation, be seen by the aid of a microscope, in vast numbers, traversing with great activity every drop of blood examined. They are said to attack and destroy the red corpuscles, and thus directly interfere with the nutrition of the body. When the acute stage has passed, these roving organisms disappear, although they leave their eggs behind them; the temperature falls; and there is an interval of apparent health. They are so tenacious of life, that, unless under special and very exceptional treatment, the sufferer, after passing through a more or less prolonged course of crises and intermissions (Steel has observed as many as seventeen), finally dies of exhaustion, and from the diseased changes in his system, to which the disease had given rise.

Under the microscope, the presence of these parasites in a drop of blood, is indicated by an irregularly intermittent and characteristic quivering of some of the red corpuscles, which are much altered in form; although the white ones remain unchanged in appearance. After a further and careful examination of this "slightly quivering blood, we may at length see a minute thread-like organism, with eel-like movements, emerge from the mass of corpuscles and move slowly forward, or we may observe the little being tugging, with all its might, at a red corpuscle, endeavouring to detach it from its rouleau" (*Steel*). The parasite is about $\frac{1}{6}$th of the diameter of a red corpuscle in thickness, and is from three to six times its length. It seems to have a thick body and a spiral tail.

MANNER AND TIME OF INVASION.—It appears from the investigations of Lingard, that this microbe, perhaps in another form, can live in water outside of the animal body. In the Bombay Presidency it has been found in the blood of a large proportion of rats and bandicoots, the health of which rodents it affects but little. Stagnant water and grass growing on lately inundated land, form favourable resting-places for the infusorian. Lingard considers that it can be conveyed to horses in water and herbage, and in grain containing the excrements of rats and bandicoots affected with the disease; but also thinks it is probable that flies act as carriers of surra from infected horses to sound ones, which is a supposition that is strongly supported by the fact that nagana (p. 459) is transmitted by the tsetse fly. This kind of fever seems incapable of being transmitted, under ordinary circumstances, from one animal to another, except by inoculation.

Although cases of surra may be met with all through the year, its microbes are particularly active during the rainy season. When outside the animal body and in a dry state, they are killed or rendered inert by prolonged atmospheric heat.

THE PERIOD OF INCUBATION seems to be liable to great variations. It may be put at 6 or 8 days after inoculation or ingestion of blood taken from an animal suffering from surra. It appears from Lingard's investigations that the period of latency may be prolonged to 13 days, if the blood used for the inoculation has been taken from the dead animal; and that when the para-

sites have been given in water by the mouth, symptoms of surra may not appear for even 75 days. We have no exact data to determine the time required for the disease to become manifest from drinking, under natural conditions, surra-contaminated water.

DURATION OF THE DISEASE.—Gunn states that the average duration of the disease is about 52 days.

LIABILITY AND CHANCES OF RECOVERY.—Horses, mules, donkeys, cattle, dogs, elephants, monkeys, camels, and other animals, are liable to contract this disease. In cattle, surra is a mild disease. In untreated cases, it is always fatal to horses, mules, donkeys, and dogs.

Lingard has proved that one attack of surra does not protect a horse from a second attack.

GEOGRAPHICAL DISTRIBUTION.—Surra is met with in Burma, Dera Ismail Khan district, Punjab, Bombay Presidency, Berar, the North West Provinces, and other parts of the Indian Empire. Supposed cases of it have been observed among French artillery mules at Tonquin. Accepting the theory which is at present being investigated by Bruce and Lingard, as to its identity with tsetse-fly disease (p. 459), it is found throughout a large portion of Central Africa. R. Kock has seen it in German East Africa; and Rouget in Algiers. Under the name of *mal de caderas* (disease of the haunches) Dr. Elmassian describes a disease which occurs among horses in Paraguay, and which is due to an organism similar to the trypanosoma of surra.

DISEASES FOR WHICH SURRA MIGHT BE MISTAKEN.—It has often been confounded with kumree; although the weakness from the general exhaustion of the one, is entirely different from that due to the local paralysis of the other. The much longer course of surra and the manner in which the internal temperature varies, serve to distinguish it from anthrax.

PREVENTION.—The best way to prevent the occurrence of surra among horses in countries in which it exists is: (1) to see that their water supply is pure. (2) To avoid giving them grass or hay taken from marshy or inundated ground. (3) To exclude the excrement of rats, bandicoots, and mice from the grain, which, if this precaution cannot be carried out, should be parched. (4) To prevent horses grazing or drinking water along the roads. (5) To have the stables on high ground. There is some reason to think that exposure to cold and draughts predisposes a horse to

surra. During an outbreak of this disease in the Parel stables of the Bombay Tramway Company during November and December, 1888, the horses were exposed to cold night winds, and 10 out of 174 died from surra. When means were taken to exclude these chilling winds, no fresh cases took place.

"The question with regard to the administration of arsenic to animals at the commencement of the rains, as a preventive, in districts where surra is epizootic, is one worthy of trial. A dose of 5 grains of arsenic in the form of liquor arsenicalis (10 drachms) given once a day in the drinking water to each animal, could not fail to produce a beneficial effect, and could with safety be continued for a month at a time. The dose of arsenic should then be gradually reduced every three days by half a grain at a time until it is discontinued altogether. An interval of seven days should then be allowed to elapse, and again the same process persevered in with intervals, until the termination of the rains, or end of October" (*Lingard*).

TREATMENT.—To Lingard is due the great credit of having devised a system of treatment with arsenic, by which horses suffering from this hitherto invariably fatal disease, have recovered. Briefly stated, he begins, in the case of a full-sized horse, by giving 5 grains of arsenic (in the form of liquor arsenicalis) twice daily, and gradually increasing the amount by half a grain in two days until 18 or 20 grains are given daily. The dose may then be decreased gradually as the condition of the animal may indicate, to 4 grains twice a day. Giving the patient rice-water morning and evening, immediately after the arsenic, will increase his tolerance of this drug. Good feeding and judicious exercise will favour his chance of recovery. For further details of Lingard's special treatment, I beg to refer my readers to my translation of Friedberger and Fröhner's "Pathologie."

Tsetse Fly Disease (*Nagana*).

CAUSE AND NATURE.—The *tsetse* fly (*Glossina morsitans*), which is found throughout a large portion of Central Africa, has long been regarded as the cause of horse traffic being impossible in the districts it inhabits. It is about half an inch long, and somewhat resembles in appearance the common house fly. It has a long thin proboscis; chestnut thorax (chest), marked longitudinally by four black lines; and a yellowish-white abdomen of five rings (A. Laboulbène). The points of attack which it seems to prefer are the lower part of the belly, insides of the thighs and under the tail. The stricken animals become

weaker and weaker and finally die from debility after a variable period of suffering which may extend from a few weeks to two or three months. Bruce, who has investigated *nagana* (*Zulu*, depressed in spirits) in its native abode, considers it to be surra; as the microbes of both appear to be almost if not quite identical, and the principal symptoms are the same. Lingard found that the microscopical appearance of the flagellated infusorian of nagana is exactly similar to that of the surra microbe. The only difference between the two seems to be that horned cattle are susceptible to the "fly," but are nearly immune from surra. Bruce regards this comparative immunity as a peculiarity of Indian cattle, which, if his theory be correct, resemble Algerian sheep (p. 18) in their freedom from anthrax. Dogs are attacked by both diseases. Theiler ("Vet. Record," 1st March, 1902) tells us that the dog is the most susceptible animal and the one in which the illness runs the quickest course. Bruce has found that "the fly" is in no way virulent of itself; but that it acts simply as a carrier of the disease germ. "The fly" disease proves fatal to all members and hybrids of the horse family except zebras.

Theiler states that the tsetse fly is dependent for its existence on big game, in the blood of which, Bruce frequently found trypanosomata (the microbes of this disease); and that the more big game are pressed back by the advance of white men, the more the disease disappears.

Recent researches show that human beings are liable to be affected by a disease closely akin to surra and nagana, as we may see from the following extract from "The Lancet" of 11th January, 1902, concerning a case of trypanosomatosis in a European, which came under the observation of Dr. J. E. Dutton on the Gambia:—

"The preparation reveals typical trypanosomata, few in number. The account of the case shows that the patient has been suffering from a form of relapsing fever with peculiar œdema of the eyelids and puffiness of the face, also œdema of the legs, general weakness, abnormal frequency of pulse and of respiration, and enlarged spleen. There was no organic lesion of the heart and kidneys, and no malarial parasites were found after repeated examination. The relapsing fever recalls that of horses suffering from the same parasite. It is not yet certain whether the parasite approximates to T. Brucii or to T. Lewisi."

SYMPTOMS AND POST-MORTEM APPEARANCES.—"The clinical symptoms of nagana are little typical. Advancing anæmia and hydræmia run concurrently with emaciation. There is œdematous swelling of the deeper parts of the rump and other

portions of the body, and there is pale watery appearance of the visible mucous membranes. Near the end, preceded by a long agony, the animal presents a living skeleton. In all large animals the eyes become affected (conjunctivitis, keratitis and blindness may ensue). As long as the strength of the patient keeps up, appetite is not destroyed.

"Autopsy shows remarkable poverty of blood, muscles poor in fat and œdematously infiltrated, œdema of breast, abdomen, neck and back; lymphatic glands enlarged and softened. In abdomen large quantities of straw-coloured fluid. Very often catarrh of the mucous membrane of intestine. Dropsies into pericardium; petechial spots on peri- and endocardium. Bone marrow yellow, gelatinous and full of hæmorrhages. Collections of fluid in spinal canal" (*Theiler*).

Bruce describes the *post-mortem* appearances of nagana as being nearly similar to those of surra.

TREATMENT.—Bruce, following the procedure of Lingard, found that arsenic (given in the food to the extent of 12 grains daily, in the form of liquor arsenicalis) arrested the progress of the disease in a horse, and enabled the animal to continue at work.

Influenza (*Pink-Eye*).

DEFINITION.—Influenza is a specific and infectious fever which shows a marked tendency to rapidly spread over large areas of country. It generally appears suddenly, without preliminary symptoms, and may become fully developed in twenty-four hours (Friedberger and Fröhner). In it, the usual symptoms are those of catarrh; although chest, bowel, rheumatic, or brain complications may be present, either singly or combined. It always gives rise to great debility.

Influenza is also known as Distemper, Pink-Eye, American Horse Disease, and Epizootic Catarrh.

NATURE.—Although, up to the present, no specific microbe has been positively demonstrated to exist in cases of equine influenza; the resemblance between this disease in horses and *la grippe* are so numerous and close, that we have good grounds for accepting as a fact, the supposition that the former is due to a micro-organism nearly akin to the bacillus which Pfeiffer found in the phlegm of persons suffering from the latter. The respective microbes—granting the truth of this theory—are not identical; for the disease is not communicable from the horse to man, or *vice versâ*. Besides,

there seems to be no connection between outbreaks of influenza among men and those among horses. Pfeiffer set up influenza in rabbits by applying to the nasal mucous membrane of these animals, the germs which he had obtained from influenza-infected men. The human influenza bacillus requires a certain amount of moisture for its existence and development.

Influenza being highly infectious, spreads, as a rule, with great rapidity.

Williams considered that the outbreak of this epizootic which affected a great number of horses in Edinburgh and the surrounding districts, during the months of January and February, 1877, was due to the saturation of the ground with water, owing to long continued wet weather; and advanced the fact, in support of this statement, that cases were, comparatively, very rare in stables, the floors of which were waterproof on account of being covered with cement. This bears out the theory that the microbe of equine influenza, like that of human influenza, develops best under conditions of moisture. It has not unfrequently happened, that stables for which influenza has shown a marked partiality, have been rendered sanitary, by taking up the flooring, and putting it down afresh, and by carefully draining the building.

The mode by which the influenza of the horse is propagated is entirely unknown. Trasbot states that he has often tried to produce the disease by inoculating with the blood, with the discharge from the nose, and with other products; but always in vain.

For safety's sake, it is well to isolate, for at least a week, even apparently sound horses which have been recently brought from districts in which influenza is rife, before they are allowed to enter stables containing healthy horses.

Stallions which have had influenza, sometimes remain capable of infecting mares they cover, for several months after they have apparently regained perfect health.

Although the type of influenza varies greatly, both in individual cases and in different outbreaks; the cause of the disease appears to be the same in all, however dissimilar may be its manifestations. Symptoms of catarrh may be prominent in one case, or in one epizootic; those of bowel disorder in another; and symptoms of rheumatism may manifest themselves indiscriminately.

VARIETIES.—Influenza may be roughly divided as follows:—(1) simple catarrhal influenza; (2) pink-eye; (3) abdominal or enteric influenza; (4) rheumatic influenza.

Some authorities consider that when the mucous membrane which lines the eyelids, presents a pink appearance, the disease is a different one from the simple catarrhal form; while others hold that

pink-eye is but an aggravated variety of the catarrhal form. For convenience sake, I shall adopt the latter view. This peculiar colour of the inside of the eyelids was a marked symptom of the great epizootics which appeared during 1877 and 1882-3 in England and Scotland. In the bowel form, which is the gravest of all, the mucous membrane of the eyelids is of a brick or orange red. Hence, it would appear that the colour of the mucous membrane is regulated rather by the severity of the attack, than by any difference in the exciting cause of the disease.

DISTRIBUTION.—Influenza is well known throughout the United Kingdom, North America, the Continent, and, to a less extent, in India.

DURATION.—The acute stage usually runs its course in less than a week. When there are no complications, recovery is generally complete within a fortnight.

IMMUNITY acquired from one attack may last from one to six years (Cadiot and Ries).

The MORTALITY among properly treated cases, will not exceed 3 per cent. as a rule.

SYMPTOMS.—The distinguishing characteristics of influenza are the suddenness of its attack, its widely-distributed nature, and the debility, depression, and rise in internal temperature (to 104°, or even to 105° F.) which accompany its onset. Simple catarrhal influenza, besides these characteristics, has little to distinguish it from nasal catarrh (p. 369). In ordinary pink-eye, catarrhal symptoms are, usually, not well marked. An attack is not unfrequently preceded by colicky pains. There is considerable rise of the internal temperature, which may be observed, at least, twenty-four hours before the manifestation of the symptoms; great debility; stiffness of the limbs and body at first; weak, frequent pulse; and a pink appearance of the inside of the eyelids. There is great dulness; in fact, the animal is in a more or less unconscious state. As a rule, the eyelids swell, and tears flow from the eyes. Constipation is generally present; although those cases in which spontaneous diarrhœa or profuse staling occurs, recover far more rapidly than the others. The stiffness of the limbs is usually followed by swelling of those parts, and consequent disappearance of pain. Sometimes, there is great lameness as if from inflammation of the feet (laminitis, p. 184). Occasionally, cough and soreness of the throat are present. Symptoms of inflammation of the lungs may also appear.

The great danger to be dreaded in pink-eye is the formation of clots in the blood-vessels. In fact, we may often find a horse which was previously doing well to all appearance, die suddenly on account of the existence of a clot of blood in the heart. I may explain that in the living healthy body, blood always remains fluid; but when the vitality of the system is lowered, the constituents of a clot (p. 12), which were previously held apart, tend to unite. As debility of the heart, which is a prominent feature of this disease, is one of the chief causes that induce coagulation of blood in the vessels, our efforts should be directed to maintain the strength of this organ, as well as to preserve the fluidity of the blood. It is almost needless to say that the more insanitary and damp a stable is, the more liable, during an outbreak, will horses in it be to an attack of influenza, and the less able will they be to combat the evil effect of the disease.

Bowel complications, when present, usually appear along with the catarrhal symptoms, or may follow them. There is more or less continued abdominal pain. The mucous membrane of the eyelids is, generally, of a bilious red colour; and the pulse, frequent and wiry. Robertson has observed blood-spots (p. 518) on the mucous membrane of the mouth and tongue. Rheumatism frequently supervenes, is often localised in the joints, and not uncommonly in the back tendons. It is apt to appear in parts that have been previously weakened by injury. The epizootic of 1882-3, which raged throughout Scotland and the North of England, and which chiefly manifested itself in the intestines, proved fatal in many cases. The abdominal pains were not unfrequently accompanied by lameness, which was usually confined to one leg. Sometimes, a swelling containing a gelatinous-looking exudation appeared on the coronet of the affected limb.

In some cases, the liver or red corpuscles of the blood (p. 451) become implicated, as shown by the mucous membranes of the mouth and eyes assuming a yellow hue. Hence, the disease has been given the misnomer of *bilious fever*.

We may, also, have complications arising from bronchitis, pleurisy or pneumonia, either singly or combined.

TREATMENT.—One of the great secrets of success is to grapple with the disease, at its very first onset, by judicious treatment and careful nursing. During the continuance of an outbreak, every horse should be watched, and, if possible, his internal temperature taken from time to time, so that there may be no chance of his being worked while the disease is hanging over him; for if this happens, his life may be endangered; or at least his recovery will be greatly retarded.

It is almost always well to shift the horse out of the stable in which the disease has become developed. He should be placed in a warm, well-ventilated box, and should be carefully clothed, so as to encourage his skin to act. At first he should be fed on laxative food, but when the acute stage has passed, his strength should be kept up by liberal feeding; two or three quarts of ale or stout being given daily if necessary. Judicious exercise is generally beneficial, especially when the legs have "filled" a good deal.

Simple catarrhal influenza may be treated as ordinary catarrh (p. 369). If there be constipation, give ½ pint of linseed oil as a drench, and administer an enema. Reasoning from the fact already stated, that cases in which spontaneous diarrhœa or profuse staling appears, as a rule rapidly recover; we may conclude that it is good treatment to promote these actions. We must, however, recollect that if there be symptoms of abdominal complications, as would be evinced by continued colicky pains, a purgative should on no account be given; as its action would be directed in still further localising the malady in the intestines, and would, thus, seriously endanger the life of the patient; for the abdominal form of this disease is much more dangerous than the catarrhal one. If pink-eye be prevalent, we should be very careful in giving purgatives to horses unaffected by this disease; for even a mild aperient would be likely, by weakening the bowels, to predispose the animal to which it was given, to contract the intestinal form of influenza.

We may, then, in pink-eye, if neither diarrhœa nor continued colicky pains be present, give ½ pint of linseed oil, followed by a drench composed of—

Carbonate of ammonia	1 drachm.
Nitre	2 drachms.
Cold water	1 pint.

This drench may be given three times a day, and may be continued for three or four days, or until the severity of the symptoms abates.

If carbonate of ammonia be not at hand, we may give a drench of—

Turpentine	1 oz.
Linseed oil	8 ,,

To be repeated three times a day, in the same manner as the other drench, and an ounce of nitre in the food or water daily.

Turpentine acts as an antiseptic in checking morbid changes in the blood; as an astringent in preventing undue transudation of serum; as a diuretic in hastening the removal of effete matter from the system; and as a stimulant in supporting

30

the strength. Both the carbonate of ammonia (a powerful diffusible stimulant) and the nitre (a diuretic) appear to have a well-marked action in retarding the coagulation of blood in the vessels. During the progress of the disease, the animal should be freely supplied with common salt, which is not alone a useful antiseptic, but also tends to keep the blood fluid, and is necessary for the building up of tissue.

We should not be deterred from giving a laxative by the existence, in the animal, of great debility, which will be relieved as soon as the bowels begin to act. This seems to indicate that the weakness is caused by the presence, in the blood, of some deleterious matter (p. 448) which acts on the nervous system. As the bowels, in this disease, are very susceptible to the action of purgatives, we should give such medicines only in small doses.

If there be soreness of the throat, neither carbonate of ammonia nor turpentine should be given, as either medicine would cause irritation, and thus greatly distress the animal. In place of them, linseed oil and nitre may be substituted, and may, respectively, be given in the mash and water.

Owing to the debilitated state of the animal and danger of blood-clots being formed, aconite should not be given; as it is a sedative to the action of the heart. Opium is also contra-indicated; for its administration affects the brain, and checks excretion.

If symptoms of abdominal pain be present, a ball or a soft mass, made up with treacle, of—

Camphor	2 drachms.
Extract of belladonna...	1 drachm.

may be given twice, or, if need be, three times a day; or one-twentieth of a grain of sulphate of atropine, subcutaneously (p. 633), may be used instead. Relief may be obtained by warm fomentations to the sides. If constipation exists along with the colicky pains, the bowels should be regulated by administering an enema, and giving, say, a quarter of a pint of linseed oil twice a day. If diarrhœa be present, it should not be checked, unless when it threatens to reduce the strength too much, and then, only by giving a thin solution of starch or flour gruel, which may have some powdered chalk mixed through it.

If the rheumatism prove obstinate, it should be treated as described under that heading (p. 524).

Contagious Pleuro-Pneumonia (*Dry Influenza*).

Although the term "influenza" should be restricted to catarrhal affections which spread over large areas of country, it is also

applied to a contagious form of chest disease, in which the symptoms of pleurisy are, generally, well marked, and are preceded by a fevered state of the system, as indicated by a rise in the internal temperature. Ordinary influenza is essentially an epizootic, in that it spreads on all sides. This affection is characterised by its enzootic nature, that is to say, by its tendency to rage in certain localities. It shows a marked preference for certain stables, which are generally badly drained and insufficiently ventilated. Although it is contagious, and appears to spread only by contagion; a fair proportion of horses—probably more than 50 per cent. on an average—resist its invasion. The fact of so many horses escaping may be due to their having acquired immunity from a previous attack, which may have been so mild that it did not attract particular notice. The better a horse's health and condition is, the greater chance will he have to escape. "This disease may be contracted by a short stay in an infected place. Convalescent subjects are particularly dangerous; for they remain for several weeks capable of spreading the contagion" (*Friedberger and Fröhner*).

The SYMPTOMS at first are those of fever, which lasts about six days, rather than of chest trouble; the pulse and respiration being hurried, and the temperature raised. The lining membrane of the eyelids assumes a brick-red or yellowish-red colour. By the symptoms we may recognise three forms of this disease: (1) an attack resembling the fever to which young horses recently taken up from grass are liable (p. 450); (2) uncomplicated pleuro-pneumonia, in which the well-marked pleurisy and pneumonia run a regular and fairly mild course; and (3) when complications of the heart, digestion, kidneys, or brain, and when purpura, or blood poisoning sets in.

TREATMENT.—The general treatment described on p. 356, *et seq.*, should be followed here. We may safely and with benefit give, at first, a dose of quinine, say, ½ oz. in a ball, and continue it in quantities of not less than two drachms daily. If expense be an object, or if drenching distresses the animal, arsenic (p. 601) may be substituted for quinine. The earlier cases are taken in hand, the more successful will be the result.

Strangles

is an infective disease which is peculiar to the horse-family, and which manifests itself locally by catarrhal symptoms and usually by suppuration of the lymphatic glands that lie between the angles of the lower jaw, and consequently by swelling of that

30*

part. It is sometimes accompanied by blood-poisoning (p. 532), and is then usually called *bastard strangles.*

It may attack horses of any age; but is chiefly seen in those which are under six years old. It rarely affects the same animal twice. In these respects, and from the fact that a large proportion of colts and fillies suffer from it, it may be said to bear the same relation to the horse as distemper does to the dog; or measles, to man. Bad sanitary conditions, especially the crowding of young stock, certainly favours its spread. The probability of escape is entirely a question of infection, which cannot occur unless the specific disease germ be present.

Jonsson states that strangles is unknown in Iceland.

NATURE OF THE DISEASE.—Strangles is caused by the streptococcus of Schütz.

SYMPTOMS OF UNCOMPLICATED STRANGLES.—The horse is dull, off his feed, and feverish; the internal temperature being generally about 103° F.; or a little higher. "The first local symptoms are an acute catarrh (running) from the nose, the mucous membrane of which is uniformly red and covered with blood-spots. It secretes a discharge which at first is watery or sticky; but becomes thick (from the presence of mucus) from the third day, and changes into whitish-grey or greenish-yellow later on. This pus-containing catarrh almost always issues from both nostrils; but is sometimes more from one side than the other. It is abundant in young subjects; but may be hardly noticeable in old ones. In very mild cases the attack becomes aborted, the course of the disease recedes, and abscesses do not form in the glands; but in the majority of instances, the discharge of pus from the nostrils is accompanied by a hot and very tender swelling of the glands between the branches of the lower jaw" *(Friedberger and Fröhner).* As a rule, this abscess comes to a head in about ten days. There is, generally, cough, and more or less difficulty of breathing on account of the swelling. In simple strangles, there is only one tumour, which, as a rule, is clearly defined. The abscesses, in all cases of strangles, are connected with glands. On various occasions, I have seen the glandular inflammation manifest itself first in the parotid glands (the glands which, on each side, extend from a little below the ear to the angle of the lower jaw), and later on in the submaxillary glands, which are situated in the space between the angles of the lower jaw, and which are the usual seat of the swelling in strangles. In such cases, the parotid abscess or abscesses (according as one or both sides were attacked) burst close to the joint of the jaw, just below the root of the ear;

and the abscess of the submaxillary glands came to a head, later on, in the usual manner. This complication did not appear to increase in any way the severity of the attack.

A manifestation of strangles which is sometimes present, is a skin eruption that takes the form of nettle-rash (p. 160), or eczema (p. 150), the serum of the vesicles of which, according to Trasbot, is capable of communicating the disease by inoculation.

Uncomplicated strangles is a mild disease which runs its course generally in less than three weeks' time.

COMPLICATED STRANGLES.—The usual complication of strangles is extension of the inflammation from the mucous membrane of the nose to other air-passages, with the result of laryngitis, nasal gleet, pus in the guttural pouches, inflammation of the lungs; and the formation of abscesses (by pyæmia, p. 532) in the lungs, liver, kidneys, and other parts of the body. Fiedler considers that roaring is sometimes caused by such an abscess forming in the glands on the left side of the neck, about the middle of the jugular groove. These abscesses do not come to a head, after running a regular course, as does the abscess of simple strangles. As a rule, these swellings appear between the branches of the lower jaw (their typical position), at the base of the neck, at the point of the shoulder, under the shoulder-blade, in the chest, or in the abdomen. When they are under the jaw, they remain hard and indolent, and may, even, diminish in size. "At other times, particularly when affecting the lymph-glands at the point of the shoulder, the abscess is of great extent, and the pus well formed" *(Robertson).* Here we have a case of abscess due to pyæmia, similar to that described on p. 78. The internal glands which are usually affected, are those of the mediastinum and of the mesentery; the former being the partition that divides the cavity of the chest into two parts; and the latter is the membrane that suspends the intestines from the roof of the abdomen. In both cases a fatal termination may be expected. When the mediastinum is involved, there is cough, difficulty of breathing, and dropsical swellings of the chest. When the abscesses occur in the mesentery, "the most prominent and characteristic sign is a total loss of appetite, or an apparent loathing of food associated with occasional colicky pains" (*Williams*). The existence of these pains points to interference with the action of the intestines.

In these complicated cases, the febrile symptoms are, generally, better marked than in the simple form; especially, when the internal organs are involved. If the temperature rises to 104° or 105° F., we shall have good reason for concluding that an internal

abscess is in course of formation. When death occurs, it is almost always due to blood poisoning. "Frequently and particularly at the time of convalescence, purpura appears as a complication of strangles" *(Friedberger and Fröhner).* In some cases, for a month, or even more, before the abscess appears, the animal loses condition; his coat stares; he becomes "hide-bound"; has a cough; and is "out of sorts." This state has been sometimes mistaken for glanders.

The PERIOD OF INCUBATION is stated by Cadéac to vary from three to five days. Friedberger and Fröhner put it at from four to eight days.

TREATMENT.—If the animal be at grass, he may be taken up and put into a comfortable stall, which should possess every condition necessary for health; such as, proper ventilation, good situation, and freedom from crowding. At the same time we must remember that attacks of strangles are often so mild, that an affected animal which is at grass, need not be taken up; supposing, of course, that the weather is favourable. Under such circumstances, I would prefer to leave him at grass, with a comfortable hovel or loose box at hand, so long as he keeps in good spirits. We should give a laxative, though fairly generous diet, which may consist of bran and linseed mashes, gruel, boiled barley, carrots and freshly-cut grass. If there be constipation, administer an enema (p. 632), and, if necessary, give half a pint of linseed oil as a drench. It is advisable that the bowels should be regulated by the nature of the food. Half an ounce of water may be mixed daily in the water. Valuable horses, and especially those which are suffering from the dangerous form of the disease, can, if the swelling at the throat does not render balling or drenching dangerous, get 2 drachms of quinine twice a day until the bodily temperature (normal, 100° F.) is reduced to the usual standard. If difficulty of swallowing exists, 1 oz. of liquor arsenicalis given in the food for a week, may be substituted for the quinine. I am strongly of opinion that as soon as the swelling under the jaw appears, it should be well blistered with biniodide of mercury ointment (1 to 4 of lard), which has a good effect in checking the development of the abscess. The application should be repeated if necessary. The abscess should be opened with the knife when it becomes soft (p. 78), and the part treated antiseptically (p. 67, *et seq.*).

If the breathing becomes painful, the horse may be made to inhale steam from boiling water mixed with about a quarter of a pint of oil of turpentine, the action of which is to accelerate the discharge from the nostrils. If the breathing becomes very

difficult—the animal fighting for breath—tracheotomy must be performed.

During the after treatment, the horse should be liberally fed and may have a couple of quarts of beer a day, with three or four drachms of iodide of potassium daily in his food or water as a preventive to roaring. As there is danger and difficulty in drenching, that operation should be dispensed with, as much as possible. In all cases, the horse should be carefully nursed and his strength kept up.

Roaring is the chief after-effect to be feared from an attack of strangles. The fact of a horse having safely passed through this disease increases his value.

Anthrax.

SYNONYMS.—Loodiana Fever, Horse Plague, Charbon.

DEFINITION.—A specific disease which runs a rapid and generally fatal course, and is characterised by an imperfectly oxidised condition of the blood, which becomes thick, dark coloured, and more or less incapable of supporting life.

DISTRIBUTION.—This disease is widely distributed over the world, although it is comparatively rare among horses in England. It is well known in India as Loodiana Fever, and is frequently met with on the Eastern frontier of Bengal; particularly among the ponies of the Munipur country.

It is not confined to horses, but also attacks cattle, buffaloes, sheep, pigs, elephants, deer, and almost all the larger animals. Those which feed on herbs appear specially liable to it. Dogs are but seldom affected. It can be readily communicated to man, and then takes the form of "malignant pustule" (woolsorters' disease). Hence, the attendants on animals suffering from this disease, and persons who make *post-mortem* examinations of anthrax-stricken animals, should be most careful in guarding against the possibility of their becoming inoculated by its virus.

VARIETIES.—Strictly speaking, there is only one kind of anthrax; although, for convenience sake, we may divide it into anthrax accompanied by swelling of the throat and neck, and anthrax without this symptom. In the former case, the seat of the disease seems to be located chiefly in the organs of breathing; in the latter, in those of the abdomen. The one might be termed the thoracic form; the other, the abdominal.

SYMPTOMS.—There is a marked rise in the internal temperature, which not very unfrequently exceeds 107° F. The horse,

with little or no warning, becomes dull, the appetite fails, and there is great debility. The pulse is frequent and weak. The lining membrane of the nostrils, and that of the eyelids, assumes a bilious red colour. The breathing becomes greatly quickened; and the nostrils, widely dilated. On this account, and from the red appearance of the mucous membrane, cases of this disease have been mistaken for those of congestion of the lungs. When affected by the latter complaint, however, the animal fights for breath, and does not exhibit the depression and semi-unconsciousness of one suffering from anthrax. The breathing, which is almost entirely abdominal, as may be seen by the heaving of the flanks, becomes more and more hurried, until, at last, the animal falls from exhaustion, becomes convulsed, and dies, apparently, from suffocation. There is sometimes a flow of rusty-coloured fluid from the nostrils, and, often, towards the end, or after death, a discharge from them of foam more or less tinged with blood. Colic is frequently present. The disease may kill in three or four hours; but in cases in which the symptoms are less marked, the animal may linger on for a few days.

When there is swelling of the neck, that part and the space between the branches of the lower jaw swell, often, to an enormous extent, so that the head and neck become hard and immovable, as if they were cut out of a single piece of wood. The amount of swelling, however, greatly varies.

In the abdominal form of anthrax, the rectum is sometimes turned inside out. There are, in some cases, tumours containing yellow (serous) fluid about the flanks, under-part of the belly, and scrotum.

The GENERAL SYMPTOMS of this disease are those of impeded respiration, and of infiltration into the various tissues. Hence the painful breathing, the interference with the functions of the brain, the semi-paralysed condition of the patient, and the local swellings.

PROSPECT OF RECOVERY.—The only cases that are at all hopeful, are those in which the rise of internal temperature is not very great. Although the question of mortality is most difficult to answer, I may venture to say that the recoveries, under good treatment, average about 20 per cent. of those attacked.

POST-MORTEM APPEARANCES.—The venous blood looks like so much liquid tar; and the arterial is thick and dark-coloured. The blood from both systems of vessels coagulates far less readily than in health. The colour of the lungs varies from dark red to

black. The various internal organs, as well as the other structures, are, frequently, discoloured by the infiltration of dark, altered blood. Generally, the spleen is distended with dark-coloured blood, and its tissues are softened and broken up, almost to the consistence of a fluid. The spleen in the large majority of cases, is much heavier than usual, and is affected in almost every case of this disease. When swellings have appeared about the neck, a large quantity of thick yellowish fluid will be found under the skin of that part. Similar fluid may be found in the interior of the chest and belly. The mucous membrane which lines the windpipe exhibits an inflamed appearance. The air-passages are often filled with bloody foam. The *rigor mortis* (stiffness of the muscles after death) lasts but a short time, and the body rapidly decomposes.

NATURE OF THE DISEASE.—Anthrax is caused by the presence, in the blood and tissues, of the *bacillus anthracis*, which is one of the disease-producing bacteria (p. 448), and may be found after death in great abundance in the internal organs, and especially in the spleen. These microbes occur in the shape of short rods, which appear incapable of forming spores in the living body of an infected animal, or even after its death, as long as the skin and mucous membranes remain intact; a free supply of oxygen being seemingly necessary for their spore formation. It appears that the cause of the symptoms of anthrax is the poison or poisons formed by the ferment or ferments manufactured by the bacilli anthracis. In support of this view we have the fact that all the symptoms of anthrax can become fully developed, and even death ensue, without the rods (bacilli) being found, except in very small numbers, in the blood.

The anthrax germ gains entrance into the blood, as a rule, by means of the forage which the animal eats, or by the water he drinks, as has been frequently proved by the fact of the disease having been communicated by contaminated drinking water. Pasteur, when experimenting on animals to whom he gave forage moistened with a fluid containing these germs, found that the animals' liability to contract the disease in this manner was greatly increased when their mouths were sore, and when the food contained rough substances, such as thistles, which are apt to wound the mucous membrane of the mouth. He also found that the mouth was almost always the part which first became affected. These microbes can seldom gain entrance into the system of the horse by means of the breathed-in air. Bollinger has shown that flies taken from the dead body of an animal which had died of anthrax, are capable of communicating the disease by inoculation. Although the microbes of anthrax may be carried directly from one animal to another, the vast majority of cases occur from transference at a time when they were living outside of the animal's body, as, for instance, on infected pasture. We find in human

beings that anthrax is sometimes carried by dust from infected hides or wool, in which case the anthrax germs begin their assault on the air-passages.

An attack of anthrax, like one of small-pox in the case of human beings, confers almost complete immunity from a subsequent one.

Want of drainage and insanitary conditions seem to be the two great influences which favour the spread of these bacteria, in the same manner as they do other low forms of vegetable life. Thus, we find that draining, clearing, and tilling land infested by these disease-producers, has, in a great number of cases, rendered such pastures healthy. The same may be said as to covering the floors of infected stables with concrete, and draining and ventilating these abodes.

In many hot countries, the seeds of anthrax seem to remain permanently in pastures which are favourable to their existence, and in such cases appear to need only certain conditions of climate to make them assume a virulent form. Hence, in such countries, it would be manifestly impossible to prevent the occurrence of the disease by destroying the affected animal. Although the micro-organism of anthrax may maintain its existence outside the animal body for a considerable time in England, it does not appear capable of becoming a permanent resident in our pastures; and consequently, we find that "stamping out" acts well in this country.

"Evidences," as regards Loodiana fever, "are rapidly accumulating to prove that the virus of the disease is brought to troop horses with the grass grown upon inundated soil, especially the creeping grass. Horses fed upon rumnah grasses cut above ground are far less subject to the disease than those fed on the common huryali, which is cut on or below the surface, and has much of the soil brought in with its stem" ("Veterinary Returns of the Madras Army").

Anthrax appears to occur at all altitudes and in all latitudes.

Bollinger states that ground impregnated with the blood or dung of animals suffering from anthrax, will remain virulent for a long time. This will be especially the case, if the soil in question be soft, damp and badly drained. The same authority considers that flies play a large part in distributing the disease.

The germs of anthrax are often imported in foreign hides and wool, and sometimes even in grain. They not unfrequently infect land and water by drainage from tanneries and wool factories.

Pasteur points out that if an animal which has suffered from anthrax be buried under ordinary conditions, the ground immediately over the carcase will, in a short time, become infested with

these germs, owing to the fact of earth worms bringing them to the surface. Hence, the dead bodies and excreta of such animals should, if possible, be burnt.

Anthrax germs will retain their vitality for years when kept in a dried condition. The action of boiling water, and of certain antiseptics, such as corrosive sublimate and carbolic acid, destroys them.

PERIOD OF INCUBATION.—Gerlach has shown that the period from inoculation to the time the disease manifests itself, varies from two hours to three days. It appears, from the experiments of Toussaint, that the larger the amount of virus received by an animal, the more rapid will be the course of the disease. Forty-eight hours is considered to be about the ordinary period of incubation.

DURATION.—The usual apparent duration of the attack, in fatal cases, varies from twelve to forty-eight hours. Some cases terminate fatally in as short a time as three hours; while others may linger on for five or six days.

IDENTIFICATION OF ANTHRAX.—In order to verify the conjecture that a horse has died from anthrax, we may inoculate, with blood obtained from the horse in question, other animals, such as rabbits, mice, or guinea-pigs. The last-mentioned are very susceptible to this virus.

If the blood of animals suspected to be suffering, or to have died, from anthrax, be required for microscopical examination in order to determine the nature of the disease, it is well to take it shortly before (when the attack is at its height) or shortly after death; for the microbes of anthrax disappear proportionately to the extent to which the bacteria of putrefaction invade the carcase. Professor McFadyean points out that although anthrax germs will be found in the greatest number in the fresh spleen; that organ is not very suitable for examination; because it is one of the first to be attacked by putrefactive bacteria, which, owing to their resemblance to the bacilli anthracis, make recognition difficult, especially to persons who are not trained microscopists. He therefore counsels that in all cases in which we have reason to believe that putrefaction (owing to the length of time after death) has begun in the body of an animal suspected of having died of anthrax; we should, in preference to blood from the spleen, select that from the ear or foot, both of which continue free from putrefactive bacteria, long after the invasion of the spleen. For the purpose in question, we may cut off and take

away an ear from the dead body. "Even in midsummer, the blood in the veins of an ear or a foot removed from the unopened carcase on the day after death shows large numbers of anthrax bacilli, and even as late as the third day after death, anthrax bacilli are still readily demonstrable in the situations mentioned" ("Journal of Comparative Pathology," September, 1894).

SANITARY MEASURES.—Although the microbes of anthrax do not appear capable, under ordinary circumstances, of being carried by the air from one horse to another; the risk of contamination of ground, fodder, and water by anthrax-stricken animals is sufficiently great to render segregation advisable. Consequently, when an outbreak occurs among a stud of horses, they should be removed, if possible, to some dry, healthy position. The whole of them should be kept apart from other animals; and there should be a further division made between the sick and apparently healthy. In effecting this, the clincal thermometer (p. 681) will be found to be of great use. The water and grass or hay should be changed. Special care should be taken to avoid the use of grass grown near water which is of a marshy nature, or which comes from a polluted source. If, as is generally the case in India, the flooring of the stables be of earth, it should, before the horses return to them, be dug up for a foot or two, the old soil removed, fresh earth filled in, concrete, which should be liberally treated with crude carbolic acid, laid down, and the usual disinfecting precautions observed. The best practical measures for the purifying of anthrax-contaminated land is draining and a good dressing of lime, and salt (p. 408).

As the eating of anthrax-tainted flesh is liable to produce the disease; such flesh, in a raw state, should not be used as food for other animals. The danger of inoculation to those persons who have to cut it up, should preclude its employment even in a boiled condition. The bodies of such animals should, if possible, be burnt. If this cannot be done, we should bury them deeply in sandy soil without breaking the skin, so as to prevent, as far as possible, spore formation. The bacteria of anthrax, tetanus and other diseases multiply by forming spores, which are round and oval bodies and which are far more resistant to destructive agents than bacteria. The free use over the diseased carcases, of crude carbolic acid, quick lime or other available disinfectant, will be productive of good.

Up to the present, protective inoculation against anthrax has not been very successful with horses.

TREATMENT.—I have obtained good results from the administration of an ounce of oil of turpentine in half a pint of linseed oil, every hour for four or five times. Or we may give, as recommended by Colonel Fred Smith, an ounce of carbolic acid in a quart of water, and a drachm in a proportionate amount of water every hour afterwards, as may be required. We may inject under the skin (p. 633), at various points where the swellings appear, a solution of carbolic acid and water, 1 to 40.

South African Horse Sickness.

I have seen several cases of this disease during a tour I made through Cape Colony, Orange River Colony, the Transvaal, and Natal, in 1891 and 1892.

DEFINITION.—"Horse sickness" is an infective disease, which is characterised by intense congestion of the blood vessels, with grave alteration of the blood, so that there is an escape from the blood vessels of a large quantity of the watery portion of the blood into various tissues.

VARIETIES.—The two ordinary forms of horse sickness are: the lung form (Dutch, *dun-paardziekte*), which is the most common kind; and "Thick head" (Dutch, *Dikkop-ziekte*). The manner in which the effusion is localised constitutes the only difference between these two forms, which more or less run into each other. "Blue tongue" (Dutch, *Blautong*) is a third form, which may be regarded as a variety of dikkop.

THE PERIOD OF INCUBATION is about eight days, with probably a variation of about one day, one way or the other.

SYMPTOMS.—Dr. Edington, Director of the Colonial Bacteriological Institute, Cape Colony, who is the great authority on this subject, states that the first symptom of the lung form of horse sickness is a shivering fit, with a rise of temperature up to 103.1° F. in the evening; that the temperature next morning is lower, though not quite normal, and rises still more in the evening; and that it thus steadily, though slowly, increases until within a few hours of death, when it may fall below the normal standard. Before this fall, the temperature reaches to a considerable height. As a rule, the appetite is well maintained up to the last day. Towards the end, there is great congestion of the blood vessels; the mucous membrane of the eyes and nose assumes a dark red colour; and a copious interlobular effusion takes place in the

lungs. The breathing becomes extremely hurried, often about 75 in the minute, with heaving of the flanks. Depression is well marked; and there is an escape, from the bronchial tubes, of watery fluid, which becomes mixed with mucus. The presence of this fluid, even before any discharge takes place from the nostrils, can be readily detected by the bubbling sound which may be heard by applying the ear to the front of the chest. As this fluid accumulates more and more in the bronchial tubes, it is discharged from the nostrils, usually in large quantities, and in a somewhat frothy condition, which it soon loses if it be allowed to collect on the ground. The fluid may trickle from the nostrils, or may be discharged in streams. Although I have never measured in a fatal case the quantity of this poured-out fluid, I think it would be about three or four pints. "I have caught quantities of this material in glass vessels, when it appears as a straw-coloured fluid, but it is spontaneously coagulable in the presence of minute traces of blood. It is coagulated by heat, and has been found to consist almost entirely of blood plasma" (*Edington*). "One very characteristic symptom is the distension or bulging of the pits above the eyes" (*Hutcheon*). The froth that is discharged from the nostrils is produced by the plasma which has transuded into the bronchial tubes and air-cells of the lungs, and which is somewhat similar in composition to the white of an egg, becoming whipped-up into foam by the breathed-in air. To use Edington's happy expression, the animal is practically drowned in its own blood serum.

The disease runs a fatal course, usually in about four days, taking the period of incubation at about eight days. During the first two days of the attack, there is little to attract casual attention. Vet.-Lieut. Coley states that the lining membrane of the eyelids has invariably pectinal (comb-like) or stellate (star-shaped) blood spots on it. As a rule, the patient dies very suddenly, frequently within an hour or two of the time he was first seen to be ill. The general idea in South Africa is that the disease runs its course in a couple of hours, or even less; the cause of this mistaken opinion being evidently want of ability to recognise the symptoms until they are of a well marked character. Usually, death, principally from suffocation, comes on suddenly.

In dikkop, the chief manifestation is an enormous swelling of the head, neck, and lips. Edington remarks that the lips usually swell so much that they fall back and expose the front teeth of the lower jaw. The swelling of the head and neck in dikkop closely resembles that seen in the chest form of anthrax (p. 471). In dikkop there is always more or less congestion of the blood vessels of the lungs; and in paard-ziekte, more or less transuda-

tion of liquor sanguinis into the tissues immediately underneath the skin of the head and neck. Consequently these forms are never quite pure.

"In the blue tongue variety, symptoms of pneumonia are not very prominent. The muzzle, lips, and tongue become swollen. The tongue also assumes a dark-blue appearance. It turns cold, and often becomes too large to be retained in the mouth. Thick, dirty saliva falls from the mouth" (*Wiltshire*). The blue colour of the tongue is due to congestion of the veins of the part.

ANIMALS ATTACKED.—The disease appears to be practically limited to the horse tribe (equidæ). Donkeys and mules are less susceptible than horses, and zebras are seldom if ever attacked. "I have recently identified a disease which occurs to a limited extent among cattle as being probably of the same nature, while a disease which occurs widely throughout the Eastern Province among high-bred goats and sheep is closely related in its pathology with this malady" *(Edington).* Rickmann showed by experiments on himself and others, that human beings are not susceptible to horse sickness.

GEOGRAPHICAL DISTRIBUTION.—It appears to be confined to Africa, and attacks horses in all parts of the southern portion of that continent. It occurs every year in the Transvaal and Rhodesia; but in Cape Colony, Orange River Colony, and Natal, it takes a widely-spread (epizootic) character only in certain years, although a few cases may be found annually, here and there, in these parts.

HISTORY AND MORTALITY.—The following outbreaks have been recorded: 1780-81, 1819, 1839, 1854-55, 1891-92 (Cape Colony), 1888 (Natal), and 1893-94 (Orange River Colony). The loss of horses is very great during an outbreak of this malady. In 1854-55, 64,850 horses died of it, and in 1891-92, 13,979 horses and 149 mules. Edington tells us that in Rhodesia the annual loss is about 90 per cent.

The lung form is fatal in at least 99 per cent. of the cases. In fact, many persons who had a wide experience of horse sickness told me, when I was in South Africa, that they never knew a case of the lung form recover. The other varieties are said to be less dangerous to life, although the mortality from them is very high.

SEASON OF APPEARANCE.—In Cape Colony and Orange River Colony it rarely occurs before February, although in 1892

it broke out in the Eastern Province early in January. It is usually at its worst in April, and as a rule disappears with the first frost in May. Edington states that it begins about the end of October in the Transvaal and Rhodesia. "In Natal it generally begins on the sea-coast a little before Christmas; at Maritzburg, about February; and up country, somewhat later. March and April are the worst months. Occasional cases are met with even in the winter on the coast. One undoubted instance occurred near Ladysmith during the Boer war in 1881, in July or August, when the ground was covered with snow" *(Wiltshire).*

TRANSMISSION FROM ONE HORSE TO ANOTHER HORSE.—Experience amply proves that the disease is never, under natural conditions, communicated from one horse to another horse. "It is only directly contagious; for while horses may be inoculated with virulent blood and be permitted to die among clean animals, I have never found, during observations extending over seven years, a single case of infection from such a source" *(Edington).* Inoculation with the blood serum which is discharged from the nostrils of an infected horse, will produce the disease in many cases, but not always. Drenching with the blood of an infected horse appears to invariably convey the disease. Experience warrants the statement, that horses suffering from this malady are capable of infecting healthy pastures, and in this way would indirectly infect other horses.

CAUSE.—There is no doubt that the virus of this disease is transmitted to the horse almost always by means of damp grass. The influence of dew or damp on grass is shown by the frequent occurrence, during an outbreak, of cases of this disease among horses which are allowed to graze while dew is on the herbage, and by the almost absolute protection afforded by restricting the animals to the consumption of dry fodder. It is instructive to note that horse sickness is almost unknown in South African racing stables, the animals of which seldom, if ever, get green grass when in training. The same remark applies, with more or less correctness, to the stabled horses of South African mail coach lines, which are fed on dry food and which enjoy a marked immunity from this disease, even when animals at grass in the vicinity are dying from it in large numbers. Dr. Edington, who has done far more than anyone else in the investigation of this disease, tells us that "horses which are kept in the stable during the night are, as a rule, safe, but during last year (1899) 60 per cent. of the stabled horses in Eshowe, Zululand, died of this sickness. Veterinary-Lieutenant Coley, A.V.D., who kindly made the observations for me, stated that these horses were mainly fed

on Guinea or Ubaaba grass, mixed with forage (oaten hay) or Indian corn. This grass was usually cut in the evening and made into bundles next day. Those who took particular care to have the grass thoroughly dried in the sun before using it, did not lose their horses, while those who neglected this precaution lost heavily." While in South Africa, I heard from reliable authorities, of several cases of stabled horses, during an outbreak, contracting the disease, apparently from being fed on grass which was cut and freshly brought to them; while those which were in the same stable, but which were kept on dry food, remained healthy.

Some South African horse-owners believe that night air in the open acts as a carrier of this disease, and consequently will not work their animals after the sun has set. This precaution appears to be absolutely unnecessary as regards the prevention of horse sickness. The coach horses to which I have recently alluded, work at all hours, early and late, without the night air having any bad effect on them. South African race horses generally go out in the early morning when the dew is on the grass. The experience of a large number of South African farmers whom I have consulted, is greatly in favour of keeping horses, during an outbreak of this sickness, in a stable or even in a kraal, if it be intended to turn them out to graze, until the sun has dissipated the dew off the grass, say until eight o'clock in the morning. They have told me that keeping horses in a kraal for this object is quite as good as stabling them. I may explain that a kraal is simply a walled-in enclosure, which, being constantly trodden down by cattle and horses, has little or no grass on it. "Horses may be ridden or driven through the night, or, if wearing a nosebag, may be left at rest in a badly-infected area without becoming infected" *(Edington).*

We may reasonably assume that drinking water does not act as a carrier of this disease; because in the foregoing cases of immunity and infection, no difference in the drinking water was made. "I have taken the water from pools in horse sickness areas during a season of epidemic and have examined it microscopically, but without success. Under the supposition that the spores under a protean guise might be present among the *débris* and multitudes of animalculæ with which such waters abound, I inoculated horses with as much as 10 ccm., but without any result accruing" *(Edington).*

"Infection by inhalation may apparently be excluded, for there is abundant evidence to show that the disease is not communicated by simple cohabitation of healthy and diseased horses" *(McFadyean).*

We may safely conclude that the infective agent of horse sickness, like that of anthrax (p. 471) and tetanus (p. 527), can live, multiply, and retains its virulence outside the animal body, supposing that the conditions of climate are favourable to its existence and development.

The above statements warrant us in excluding *worms, ticks,* and *blood sucking flies* from the list of producers of this disease. Arguing against the malarial character of horse sickness, Wiltshire points out "that there have been instances of great mortality from it in one district, while an adjoining one, separated only by a narrow river, has been almost entirely exempt."

The effects of *moisture* and *heat* are well marked in this disease. "Horse sickness occurs mostly in low-lying parts of the country, independently of the fact that the general locality may be considerably elevated above the sea-level. Thus, Johannesburg, which is about 6,000 feet above the sea-level, is frequently subject to its baneful influence. . . . It is commonly observed to occur during periods when the air has become humid and has been associated with a high daily temperature. . . . Deep kloofs or gullies where vegetation is abundant and the ground, below the undergrowth, moist, are especially dangerous to susceptible animals" *(Edington).* Dry, high pastures at an altitude, say, of 6,000 feet above the level of the sea, are as a rule free from the disease, unless they have been contaminated by the introduction of affected stock; the original home of this organism appearing to be moist and low-lying lands. Many of the South African highlands which were formerly exempt, have become infected, apparently by the introduction of diseased horses. We are at present unable to say how long the microbes of horse sickness would continue to exist in a dry and cold locality, in which, we may take for granted, they would be more or less exotics. Edington's remark as to the prevalence of horse sickness at Johannesburg, shows that any preventive effect which *altitude above the level of the sea* may have on horse sickness, is due to increased cold and dryness. In almost all cases, frost stops the progress of an outbreak of horse sickness.

Practical observations and the elaborate bacteriological researches made by Edington, leave no doubt that this disease is caused by a microbe which unfortunately has not been isolated, up to the present. In this respect, Edington occupies the same position as Pasteur did with regard to rabies. We have, however, sufficient proof to reasonably assume that this organism, whatever it may be, becomes developed into a virulent condition on grass and other herbage, under the combined influence of heat and moisture. It is probable that the microbe of horse sickness (supposing that such an organism exists) forms toxins which exert a paralysing action on the vaso-constrictor nerves, and thus causes dilatation of the blood-vessels, with consequent increase in the amount of plasma exuded into the tissues, and have also a

poisonous effect on the system. " Horse sickness appears to be a septicæmia in the further sense that death is due to the toxic effects of substances manufactured by the bacteria multiplying in the blood. No doubt in those cases in which there is very extensive pulmonary œdema, interference with the æration of the blood will act as a contributary cause of death, or it may be the final cause; but in a considerable number of the experiments recorded in this article, the combined structural lesions, such as the œdema of the lungs and the exudation into the pleural and pericardial sacs, were not sufficient to account for the fatal issue. It ought also be noticed that the microbe of horse-sickness does not appear to attach itself to the red corpuscles of the blood; at least, that seems to be indicated by the fact that these corpuscles appear quite normal in preparations made from the blood, and by the normal tint of the serum furnished by horse-sickness blood" (*McFadyean*). This eminent bacteriologist considers that it is highly probable that the agent of infection of horse sickness is too small to be made visible to the human eye, even when aided by the highest powers of the best modern microscopes. He supports this opinion by the fact that " horse-sickness blood is not deprived of its infective property by filtration through a Berkefeld or a Chamberland filter," either of which might arrest some of the contained bacteria (" Journal of Comp. Path.", June, 1901).

POST-MORTEM EXAMINATION.—" Throughout the course of numerous *post-mortem* examinations one negative feature stands out in remarkable prominence, namely, the almost total absence of any true inflammatory phenomena; while the conditions obtaining might be, for the most part, ascribed to acute venous congestion with exudation of blood plasma" *(Edington)*. This fluid, which is either clear or more or less stained with blood, is found in large quantities in the windpipe, pericardium, lungs, pleural cavities, and other parts. Edington states that in one case he removed seven pints of this fluid from the pericardium, but that the amount as a rule is under five pints. Although the blood is darker than usual, it does not in any way possess the tarry appearance which is characteristic of anthrax. It coagulates with extreme quickness.

" Whichever variety of the sickness the animal may have suffered from, it is usual, though not an invariable rule, to find a huge cloud of white foam around the mouth and nostrils of the dead animal. This usually remains unchanged to any great degree for a long time, even during exposure to a hot sun. . . .

" On making an incision into the subcutaneous tissue of the neck, along the line of the windpipe, it is common to find lying along, and in many cases surrounding the windpipe and the larger vessels, a quantity of clear yellow jelly, which consists of blood serum that has been pressed out of the vessels in this situation, and has subsequently undergone coagulation. If the windpipe is opened, it will be found to contain yellow fluid in all stages of conversion into the white froth that one may notice after death around the nose and mouth.

" On opening into the large blood vessels in this area, the blood

will be found to contain clots, while the fluid between may be slightly watery and is invariably of a very dark colour.

"On removing the front of the chest, the pleuræ may be seen to be occupied by a large amount of blood-coloured fluid.

"On the surface of the lungs it is common to find a layer, more or less thick and diffused, of a yellow, gelatinous material, consisting of coagulated blood serum. The lungs are as a rule pale in colour, unless the animal has been severely ridden previous to its death. On the surface will be noticed a large number of dark-coloured lines which seem to pass over it and appear like small rivulets. If slices of the lungs be made with a knife and held up to the light, it will be noticed that the lines in question are transparent and of a yellow colour. They consist, in fact, of the yellow serum, exuded in this situation, that has coagulated, and they occupy the lines of division between the lobules of the lungs and which in health ought to be scarcely apparent. . . . In the dikkop form, the chief sign is the swelling of the head, neck, or tongue. In this form the lungs may be almost or absolutely unaffected to the naked eye.

"The spleen as a rule is enlarged and deeply congested, and over the whole surface may be seen small hæmorrhagic points. On section the capsule immediately retracts and the substance is seen to be very dark in colour, owing to the venous engorgement" *(Edington)*.

McFadyean points out that "the most constant of the lesions present in animals dead of horse-sickness is an intense congestion of the mucous membrane of the right half of the stomach." Lieutenant Coley, A.V.D., who had four seasons' experience of this disease, states, in the "Veterinary Record," that this congestion is seen only in a few cases.

THE DISEASES WITH WHICH HORSE SICKNESS MIGHT BE CONFUSED are restricted as a rule to anthrax (p. 471), congestion of the lungs (p. 364), and inflammation of the lungs (p. 353).

TREATMENT has proved up to the present to be of little or no avail, with the exception of that by Lieutenant Coley, who gives intravenous injections (p. 636) of—

Iodine	4 grains.
Iodine of potassium	15 ,,
Glycerine	1 drachm.
Boiled water	1 ,,

Out of 31 horses suffering from this disease, he had 17 recoveries.

PREVENTIVE MEASURES.—We have seen from the foregoing remarks on this disease, that if horses be at grass during a sickly period, they should be sent to some dry and unaffected grazing ground beyond the limits of the disease, or should be kept in a kraal at night, and not allowed to graze until the sun has removed all the dew from the grass. Stabled horses should be fed on dry food, such as oaten hay, and Indian corn or oats, and should on no account be given any grass which has not been thoroughly dried.

ACQUIRED IMMUNITY.—Dr. Edington has performed admirable work in obtaining a serum which, by inoculation, confers immunity from horse sickness. The practical application of this protective agent is a question which has not yet been settled.

It is a common belief in South Africa that horses which have recovered from an attack of horse sickness possess a life-long immunity from it, and that consequently their value becomes much enhanced in frequently infected districts. While in South Africa I was unable to obtain any exact information on the subject of these "salted" animals, which I had imagined were an ordinary article of commerce in that country. In fact, I failed to find a single animal of the kind, although I made many enquiries, everywhere I went. The few persons who had, so they said, seen "salted" horses, informed me that these animals present a dejected and debilitated appearance; that the skin about their head and neck is unusually loose and wrinkled; and that they are liable to relapses of the disease, though in a milder form. Mr. Wiltshire, late Colonial Veterinary Surgeon of Natal, told me that "salted" horses invariably die from horse-sickness, if they be allowed to live long enough. I see from a photograph of a supposed "salted" horse, that the hair of his mane and forelock stick out in a particularly rough and disordered manner, so that it would be impossible to have made the mane lie on one side or the forelock to fall straight down. I have always heard that "salted" horses have this peculiarity of the mane, forelock, and tail. As far as I can learn, the only peculiarity of serum-salted horses is that they "are subject at much later and irregular periods to attacks of fever. Such attacks have no relation to fresh infection, as I have found them to occur in all salted horses which I have kept under close observation in the stable. The attacks vary greatly both in degree and duration; they may last for one day, or may extend over as many as six days" *(Edington).* I am inclined to think that the "salted" horses of popular South African repute are those which are suffering from the disease communicated by the tsetse fly (p. 459).

Much interesting information on horse sickness is to be found in "The Journal of Comparative Pathology and Therapeutics" for March, September, and December 1900, and June and September, 1901.

Port Pirie Horse Disease.

In 1901, a disease which had up to that time been unknown in Australia, attacked a large number of horses at Port Pirie, South Australia, with the result of many deaths. At first the malady was supposed to be due to lead poisoning, but that idea was conclusively disproved by Dr. Ramsay Smith, M.B. C.M., B.Sc. (Chairman of the Central Board of Health, Adelaide), and Veterinary Surgeon Desmond (Chief Government Veterinary Surgeon, Adelaide), who made an elaborate investigation into the nature of this disease. The conclusions arrived at by Dr. Ramsay Smith are as follows:—"The disease as manifested in the lungs of horses at Port Pirie is in no way distinguishable from South African horse-sickness, which shows such a well-marked aggregation of naked eye and microscopical appearances as marks it off from all known diseases. The disease differs from the most common forms of South African horse-sickness in so far as it is more chronic and is associated with less fever and less dropsy of the heart-sac and of the pleural cavities." We learn from Veterinary Surgeon Desmond's report that a two-year-old filly which was found to be affected in April, 1901, was examined by him on the 5th of the following July, and was so vigorous that at first she could not be caught, "so she was run in the paddock, and at the end of ten minutes she was so distressed (the breathing could be heard at a distance of 200 yards) that she could be approached to be shot." This extreme distress in breathing, caused by slight exertion, in the case of an animal which appears to be in a normal condition when at rest, seems to be one of the most prominent peculiarities of this disease.

Two other peculiarities are the spasmodic nature of the attacks of distress of breathing, and the attempts made to breathe through the mouth, by the patient lying or throwing itself down on the ground, extending its head, and rolling, as if in colic. The following extract from Veterinary Surgeon Desmond's report lucidly describes what is meant:—"When on the ground her mouth was open, and her nose thrown upwards to the side to allow extra air to reach the lungs by mouth breathing; the tongue and lips were of a livid colour, while brown brothy mucus escaped from the nose and mouth. Mouth breathing, on account of the anatomical

configuration of the throat, is impossible while the horse stands erect. When the animal is placed on its back, or when lying on its side with its nose raised, it is possible for breathing to take place through the mouth. . . . For ten minutes this animal rolled over and over, as if in violent pain from colic. The chest, ears, abdomen, and inside of the thighs were covered with sweat. At the end of ten minutes she got on to her feet with an effort, staggered, and threw herself down, and rolled over and over gasping for breath. The respirations were 40 per minute. At 15 minutes after falling, the nose was still raised from the ground while lying on her side, and breathing was being performed by the mouth as well as by the nostrils. At this stage the colicky symptoms had passed off, and it was possible to approach her for examination. The inspirations were found to be longer than the expirations. For an hour this animal stood up and laid down alternately, and then appeared in a normal condition, while the respirations which were 40 when she fell, had decreased to 24." In South African horse-sickness, these symptoms of rolling on the ground, colic, hurried breathing, and mouth breathing, with return to normal conditions in a brief space of time, are not seen.

It appears from the *post-mortem* examinations made by Veterinary Surgeon Desmond that the lungs are the only organs which are affected in this disease. Consequently the spleen is not enlarged and congested, as is usually the case in "horse sickness" (p. 484). Also, Veterinary Surgeon Desmond states that there is always dark tarry blood in the lungs. This tarry condition of the blood is not seen in South African cases (p. 483). He further tells us that "brown froth" escapes from the nostrils, and is found in the windpipe, bronchial tubes, and lungs; but no mention is made of the cloud of white foam (p. 483), or of the discharge of straw-coloured blood serum (p. 478). Dr. Ramsay Smith tells me that the presence of coagulated serum between the lobules of the lungs (which is seen in Cape horse-sickness, p. 484) is a prominent, constant and characteristic *post-mortem* appearance in the Port Pirie disease.

In the Port Pirie disease, the superficial veins of the gums of the upper front teeth are congested and stand out prominently.

As numerous aneurisms caused by a thread-worm (said to be the *strongylus armatus*) were found in the abdominal arteries of affected horses, Dr. Ramsay Smith wisely considers that the question of their possible connection with this disease should be investigated. He is of course aware that the *strongylus armatus* and its resulting aneurisms are met with in other parts of Australia and in other parts of the world, where their presence in horses does not give

rise to symptoms in any way similar to those of the Port Pirie disease.

As I have never seen a case of the Port Pirie disease, I am not qualified to express an opinion on its nature. Having the honour of knowing the two gentlemen who are investigating its pathology, I can say with confidence that the task of its elucidation could not be in more able hands.

Cerebro-Spinal Fever

is a disease which rapidly spreads, like influenza, over large areas of country, and is characterised by inflammation of the brain and spinal cord, with consequent, and more or less complete, paralysis of the hind quarters. It appears to be an infective disease (p. 448). No specific microbe has, however, been found in cases attacked by it. Although we may infer that it is infectious; no light has, up to the present, been thrown on the manner by which it is conveyed to animals. Besides horses, it affects sheep, goats, horned cattle, and dogs. It usually runs an acute and fatal course.

The attack may be sudden, or may take two or three days to become developed. The most prominent symptoms are: unconsciousness, with or without excitement; continued spasm of the muscles of the neck; and paralysis of the hind limbs. "We may soon note hardness and abnormal tenderness of the poll. The patient can neither rise nor extend the head. The neck and sometimes the entire spinal column are hard and tense" (*Friedberger and Fröhner*). There is a high temperature of the head and of the contracted muscles. "Very early in the affection, and all through the disease, unless when the brain lesions are great, pain is evidenced on pressure being exercised with the finger along the spine" (*Robertson*). The disease usually runs its course in from one to two weeks. In some cases, the attack is mild; in others, it destroys life within twenty-four hours. As a rule, the more gradual is its approach, the less severe will be the symptoms. It has a marked tendency to recur after a few days. Observation of the internal temperature does not always afford reliable information about this disease; for even in severe attacks, the temperature in different instances, may be respectively, high, low, or normal.

Cerebro-spinal fever is well known in the United States, and is also met with in some parts of the Continent.

"Tetanus may be distinguished from cerebro-spinal fever by the continued contraction of the muscles, and by the existence of head symptoms" (*Friedberger and Fröhner*).

When this complaint breaks out, it almost invariably does so during the cold months of the year. Unhealthy surroundings do not appear to influence its spread in any way.

The death-rate, according to Hartenstein, is about 90 per cent. The attack, in fatal cases, usually runs its course within a week, not counting relapses.

POST-MORTEM APPEARANCES.—Owing to the course of the inflammation, the brain and the spinal cord, close to it, are filled with a watery exudation more or less mixed with pus, and sometimes with blood. The blood-vessels of the part are greatly congested.

TREATMENT.—If possible, we should place the animal in slings without delay; in order, by gravitation, to relieve to some extent the congestion of the brain and spinal cord. "Unless the patient is slung within twenty-four hours from time of attack, there is but slight hope for a recovery" (*Lyman*). We may give a mild dose of aloes, and a couple of drachms of belladonna, once or twice in the day, or inject atropine (p. 601), subcutaneously (p. 633); and we may apply bags of pounded ice to the spine. Up to the present, medicine does not appear to have any very well-marked power in controlling the effects of this disease. Johne advises subcutaneous injections of 10 grains of the hydrochlorate of pilocarpine.

Glanders and Farcy.

DESCRIPTION.—Glanders and farcy are different forms of a disease which is caused by the entrance into the body of a particular kind of disease germ (*bacillus mallei*). The malady is called "glanders," when it is principally confined to the lungs and air-passages (bronchial tubes, windpipe, nostrils, etc.), as will be manifested by discharge from the nose, swelling of one or more of the glands which are between the angles of the lower jaw, and ulceration of the mucous membrane which lines the nostrils. If, however, the presence of the disease is chiefly shown in the skin and tissues immediately underneath it, it is termed "farcy." When the symptoms of both forms are developed in the same animal, the sufferer is said to be glandered and farcied. A glandered animal is liable to communicate farcy, glanders, or both; and *vice versâ*. If the disease begins only with symptoms of farcy, the lung symptoms will in time become apparent, supposing that the complaint be allowed to run its course. For convenience sake, the word "glanders" is used as a general term for this disease, whatever the symptoms may be.

Mr. Hunting ("Vet. Record," 6th Sept. 1902), gives the follow-

ing table of symptoms in 1,000 cases of glanders which occurred in London, in 1901.

Farcy, swellings, buds or ulcers	414 cases
Farcy and enlarged sub-maxillary glands...	54 „
Farcy with nasal discharge, ulceration and enlarged glands	12 „

Hence we may conclude that symptoms of farcy are present in about half the number of cases of glanders.

VARIETIES.—Both glanders and farcy are respectively divided into acute and chronic forms, according as their development is rapid or slow.

GENERAL SYMPTOMS OF GLANDERS.—The characterisic sign of glanders is the formation of nodules, which are sometimes scattered; at other times, clustered together. They suffer degeneration, and form abscesses of varying size, and, generally, contain pus (matter). In acute glanders, these nodules or tubercles, which are about the size of small shot, are seen in the mucous membrane which lines the nostrils, chiefly, as a rule, on the partition (*septum nasi*) that divides the nostrils one from another. They " appear as projections on an elevated and injected base or background, and are rendered visible by the white or yellowish-white centre. This centre is surrounded by a greyish transparent zone, which again is encircled by a red areola " (*Robertson*). In a few days these nodules soften, form abscesses, burst, and leave ulcers, which resemble in appearance hard syphilitic chancres, having hard, dug-out edges. These ulcers show no disposition to heal, but run into each other, and extend superficially as well as deeply. The abscesses, probably, first appear in the lungs, then, in the various air-passages, in the sinuses of the head, and also in the various internal organs, muscles, etc. Owing to their presence, the affected animal suffers from the so-called bronchitis and pneumonia of glanders. A thin discharge issues from one or both nostrils. At first, it resembles that of ordinary cold; it then assumes a sticky or starchy character, and soon becomes mixed with pus and blood, on account of the bursting of the abscesses. The lining membrane of the nostrils becomes much inflamed and assumes a purple or coppery hue. The glands and lymphatic vessels of the head become swollen, especially the lymphatic (submaxillary) glands which lie in the hollow between the angles of the branches of the lower jaw. In chronic glanders, one or both of these glands become firmly adherent to the jaw. In the acute form, however,

the animal may die before this can take place. The eyes are generally weak and watery.

SYMPTOMS OF ACUTE GLANDERS.—This form may be the first to attack the horse, or it may be the termination of chronic glanders or of farcy. More or less persistent shivering fits; a marked rise (often of 7° or 8° F.) in the internal temperature of the body (normal, about 100° F.), and, consequently, more or less fever, usher in the attack. The coat is dry and staring; the pulse frequent and weak; the breathing hurried and painful; the animal rapidly loses "condition;" and the mucous membrane of the nose becomes filled with nodules and ulcers which run together and discharge pus. Symptoms of farcy, diarrhœa, and swelling of the limbs and head may appear. "In general, acute glanders runs a rapid course. Its constant termination is death, which usually occurs in from three to fourteen days. Experimental glanders as a rule assumes an acute type" (*Friedberger and Fröhner*).

SYMPTOMS OF CHRONIC GLANDERS.—The approach of this form is extremely insidious, there being, often, nothing to mark it beyond a slight discharge from the nose, and the fact of one or both of the submaxillary glands being hard and swollen; and no ulcers may be visible inside the nostrils. There may be even no discharge or swelling of the glands at first; or these symptoms may appear and disappear from time to time. Also, there may be swelling of one or both submaxillary glands without any discharge from the nose. The coat becomes dry and tense (hidebound). The animal gets into a weak, unhealthy state, and will sweat from comparatively slight exertion. Further than this, there is little sign of constitutional disturbance. A horse may continue in this state for many months; but at last his general health breaks up, or acute glanders sets in, and he dies.

The discharge of chronic glanders is, at first, similar to that of common cold, but soon assumes the appearance of boiled starch, or white of egg. It is sticky, and dries round the edge of the nostrils. If there exist ulcers inside the nostrils, the discharge will, naturally, become mixed with pus and blood. It usually issues from only one nostril, which will be that of the affected side —the left, as a rule—but may proceed from both. The mucous membrane of the diseased nostril is pale, and of a grey or more or less purple hue. There is swelling of the submaxillary gland or glands of the affected side or sides. The swelling is hard and adherent to the jaw. If both nostrils are affected, there will be a tumour on each side. When only one suffers, the eye on that

side will be smaller and weaker than its fellow; and, frequently, there will be a flow of tears from it.

In chronic glanders, attempts at healing are sometimes made by the ulcers inside the nostrils.

A horse is said to have sub-acute glanders when the disease takes a more or less chronic form, with ulceration in the nostrils. The term is, now, seldom used.

PULMONARY GLANDERS is a variety of the chronic form in which the disease is almost entirely confined to the lungs. There is neither discharge from the nose nor swelling under the jaw. There is a dull, dry, soft cough; the animal loses condition, is weak and languid; and the sounds of the chest are those of chronic pneumonia. The animal may thus drag on a miserable existence for months, and at last die of debility without exhibiting any further symptoms of glanders, and yet be capable, all this time, of infecting horses stabled near him. Or he may be suddenly carried off by an acute attack.

SYMPTOMS OF ACUTE FARCY.—In this form we have the same signs of constitutional disturbance—shivering, rise of internal temperature, etc.—as in acute glanders; though, generally, not to so great an extent. The local symptoms are manifested by a painful swelling, usually, of one hind limb, although other parts may be invaded. In a day or two, when the swelling somewhat subsides, or without its taking place, nodules, or "farcy buds," and enlarged lymphatic vessels ("cords"), of about the size of a goose quill, appear on the surface. These tumours, which are hard and painful to the touch, are generally clustered together and away from the joints. They usually break out on the inside of the thighs and fore-arms, or on the neck, and are about the size of a marble. They rapidly soften and form unhealthy ulcers which have a tendency to run together, and are very similar to those met with in the nostrils of glandered animals. An abundant discharge of a dirty yellow colour, and tinged with blood, issues from these ulcers and dries on their edges, or may overflow on the surface of the part. The enlarged lymphatic vessels have, along their length, prominent swellings, which mark the position of their valves that have become inflamed from the presence of the virus in the fluid which circulates through these vessels. These tumours, also, suppurate and form ulcers similar to the others. Thus, as pointed out by Robertson, we have two sources from which the ulcers arise. Both the fever and swelling are more or less remittent; the latter, sometimes, subsiding in one limb and then appearing in the other. The animal rapidly loses condition and dies from exhaustion, or from an acute attack of glanders.

Williams remarks that farcy may first manifest itself by painful swellings in the flexor tendons, or by rheumatic symptoms.

The onset and course of glanders and farcy have far from a uniform character in their manifestations.

An attack of acute farcy will run its course to a fatal termination in about a month.

SYMPTOMS OF CHRONIC FARCY.—This form differs from the acute in being much milder. There is but little constitutional disturbance, and the tumours may remain indolent for a long time.

POST-MORTEM APPEARANCES.—In almost all cases, tubercles (nodules) varying in size from that of a grain of sand to that of a small pea, will be found in the lungs, and will give the feeling of shot, when the fingers are passed over the surface of the lungs. The presence of the characteristic ulcers in the air-passages will confirm our suspicion.

SUSCEPTIBILITY AND PREDISPOSING INFLUENCES.—Asses, mules and jennets appear to be more, and men less, susceptible to glanders than horses. The order of comparative susceptibility of certain other animals is somewhat as follows:—Field mice and guinea pigs, the cat tribe, dogs, goats, rabbits, and sheep. Pigs and pigeons have little or no susceptibility to it. Cattle, domestic fowl, rats, house-mice, and white mice seem to be immune. Individual idiosyncrasy is well marked in this disease; for "some horses readily take it, when living in a stable with glandered animals, while others may remain for months and even years under similar conditions, without becoming infected. Glanders, like tuberculosis, has certain predisposing factors, the chief of which are: over-exertion, deficiency of food, bad ventilation, chill, and disease. The spread of glanders is therefore greatest during times of war" (*Friedberger and Fröhner*).

The fact that the tramway horses of the Glasgow Corporation (p. 619) were particularly well fed and looked after, appears to account to some extent for the very small percentage of clinically-affected animals that were found among them. Writing of glanders, Mr. Hunting ("Veterinary Record") states that "young horses 'break up' much more rapidly than old horses," and that "over-worked or underfed studs are invaded with much greater rapidity than those well fed and properly worked."

HISTORY. — Glanders was known to the ancient Greeks and Romans. For the first half of the nineteenth century, veterinary surgeons as a rule considered that it could occur spontaneously,

an error that was chiefly due to the fact (which was then unknown to scientific men) that many cases of the disease ran a long course, without showing any outward symptoms; and that outward symptoms were often readily developed by predisposing influences. All doubts respecting the specific nature of this disease were removed by Löffler and Schütz, who discovered the micro-organism of glanders in 1882. The next great step in advance was the preparation of mallein (p. 614) in 1891 by Kalning and Hellmann.

STATISTICS.—Half a century ago, glanders was common all over Great Britain and in the Army, from which it was eliminated in 1891 by Dr. George Fleming, who was the Director of the A. V. D. The mounted branches of the Service became again infected, to a comparatively large extent, at the beginning of the late South African war. The following table shows the prevalence of glanders in the whole of England, and also in London, during the past seven years.

Year.	No. of Cases in the Whole of England.	No. of Cases in London.	Percentage in London.
1895	1,487	1,042	70
1896	1,196	845	71·2
1897	1,324	966	73
1898	1,133	860	75·9
1899	1,269	896	70·6
1900	1,814	1,387	76·4
1901	2,304	1,828	79·3

As these recorded cases are practically restricted to those which show clinical (outward) symptoms, the number of affected animals probably exceeds 20,000.

"In Scotland, glanders is practically confined to Lanarkshire. The returns for Scotland for ten years show 1,344 horses attacked, of that number no less than 1,265 occurred in Lanark" (*Hunting*).

The term clinical, or outward symptoms, refers to the characteristic ulceration in the nostrils, discharge from the nose, and swelling of the gland or glands between the angles of the lower jaw; and to the swelling of the limb or limbs in farcy. A horse with one or more of these symptoms is said to be "clinically affected."

VITALITY OF THE VIRUS OF GLANDERS.—The microbes of glanders are incapable of preserving an independent existence outside the animal body for a long period, because they are quickly destroyed by temperatures which are respectively below and above

36° and 81° F. "Löffler failed to obtain cultures on infusions of hay, straw, or horse dung. As a rule complete drying of the bacilli of glanders destroys their virulence in about a week. According to the experiments of Löffler, a period of three months is the longest time the dried bacilli retain their activity. Cadéac and Malet state that the bacilli can be killed only by gradual drying; that they resist putrefaction from fourteen to twenty-four days; and that, when mixed with water, they continue virulent from fifteen to twenty days. Bacilli which are not dried, cannot live outside the animal body for longer than four months. Löffler therefore considers that four months is the maximum period for the infectious material to retain its virulence, and that the published reports about stables remaining infectious for many months, and even years, are erroneous. . . . For practical purposes we may say that a 1 to 1,000 solution of corrosive sublimate, or a 5 per cent. solution of creolin or carbolic acid, is sufficient for disinfection" (*Friedberger and Fröhner*). According to Sherrington, the microbes of glanders are destroyed by sunlight in about three days.

GEOGRAPHICAL DISTRIBUTION.—Glanders is well distributed over the four continents of the world; but owing to the wise enforcement of strict quarantine regulations, it is absent from the Australian Colonies. In India, it is common among horses owned by natives, whose ideas of preventive medicine are not far advanced. Although it is seldom found in England among racehorses, hunters, carriage horses, and agricultural animals; it is prevalent to a very large extent among the commercial horses of London, Glasgow, and other large towns of this country; the chief cause being the unrestricted importation of glandered horses from America and other largely-infected countries. After the Spanish-American war, great numbers of glandered horses were imported into the Southern States from Cuba, which was a hot-bed of that disease, with a disastrous result which might have been easily prevented (p. 502).

PERIOD OF INCUBATION.—This period is stated by Cadéac to vary from three to nine days. The period of apparent latency is much longer, and may extend to months, if not years. Such instances of seemingly prolonged incubation are due to the fact that the disease is confined to the lungs and other organs hidden from view. As a rule, the longer the period of incubation, the less virulent will be the attack. It is probable that glanders does not take longer than eight days to establish itself in the lungs.

COURSE.—Before the invention of mallein (p. 614), glanders was recognised only by its outward symptoms, and it was regarded as a very severe and nearly always an incurable disease. Instances have occurred of horses with outward signs of glanders (p. 500), and especially of farcy, having apparently recovered. "When the mallein test is applied to a large stud of horses among which glanders has existed for several years, it frequently happens that a notable proportion of the animals react—perhaps 20 per cent. or more—although for a number of years previously, the proportion of animals which have developed symptoms of the disease, may have been very much smaller than that. It is this experience which justifies the view that, apart from any curative effect of mallein, many cases of glanders run a mild course, and ultimately end in complete recovery" (*McFadyean*).

The microbes of glanders are taken up by the blood-vessels, whatever their port of entrance into the body may have been, and their presence in various tissues causes the formation of nodules (tubercles) which may become converted into abscesses and ulcers. The lymphatic vessels of an affected part become filled with virulent material (their office being to remove waste products), and consequently they become inflamed. The form taken by the disease depends on the part in which nodules appear, as, for instance, the lungs and air passages in glanders; and the skin in farcy.

The apparent reason for the submaxillary glands (the glands between the branches of the lower jaw) becoming affected, when ulcers form inside the nostrils, is that they receive the lymphatic vessels of the nasal cavities, and consequently become inflamed by the microbes which are brought to them by these vessels. The rise of temperature is due to the heat-producing products (p. 449) manufactured by the microbes of this disease.

When recovery sets in, the tubercles dry up, harden, and become respectively enclosed by tissue which forms capsules round them. The encysted colonies of bacilli thus gradually lose their power of transmitting the disease, and finally die.

It is generally thought that the lungs are almost always the first organ attacked by the bacilli of glanders, because, on *post-mortem* examination, they usually manifest the presence of grey translucent nodules which have a tendency to calcify (to become more or less turned into lime). Professor Schütz ("Journal of Comp. Path.," March, 1898) maintains that these grey translucent nodules have no connection with glanders, but are the result of minute threadworms blocking up small blood-vessels in the lungs, and thereby setting up inflammation, with consequent formation of tubercles. He says "that in spite of a most extensive experience, I have not

yet observed a case of primary glanders of the lungs of the horse. If one regards the 'grey translucent' tubercles in the lungs as lesions of glanders, one can arrive at such a conclusion, but the careful and diligent examination of such tubercles in the Pathological Institute has shown how erroneous this view is." He also states that the tubercles of glanders are opaque and of a greyish white colour, their centres yellow, they are surrounded by reddened zones, and they do not become calcified.

Unchecked glanders in a horse almost always runs a chronic course, in which case, ulceration in the nostrils often does not appear until several months after infection. The acute form is more common than the chronic form in donkeys and mules.

MODES OF INFECTION.—Glanders is most readily communicated by bringing some of the diseased discharge from the nostrils or from a farcy bud, in contact with a wound or with any of the mucous membranes. Hence it is advisable, when examining a suspected horse, to carefully avoid the possibility of his sneezing or coughing in one's face, which precaution can be taken by using one of the special face-guards that are manufactured for the protection of persons examining glandered horses. Inoculation with glanders-tainted blood has been found to fail more often than it succeeds in transmitting the disease.

The following are the chief ways in which the microbes of glanders can enter the healthy body:—

1. By means of the *air as a carrier.*

It appears impossible for the bacilli of glanders to be carried directly from one horse to another; for "Eug. Renault, long before Cadéac and Malet, always failed to transmit the disease to a healthy horse by making him breathe air which was given off the lungs of an acutely glandered horse; their muzzles being connected by a cloth" (*Trasbot*).

Friedberger and Fröhner state that the organs of breathing are the gate of entrance for the virus, in at least nine-tenths of cases of glanders, and that it is reasonable to assume that this transmission is effected by the bacilli-laden discharges being blown about in the form of dust, after they have become dry. In support of this assumption they state that frequently the lungs alone are affected, and that they often show the oldest changes. Professor McFadyean, who follows in the footsteps of these two German authorities, remarks that the almost constant presence of these bacilli in the lungs of horses which have caught the disease in a natural manner, and their customary absence from the abdominal organs of these animals, are strong grounds for believing that the breathed-in air is the principal carrier of the disease. This in-

halation theory ignores not only Schütz's view (p. 496), but also two very important facts: First, that the act of drying these bacilli kills them (p. 495), and that, unless they were more or less dry, they would be in an unsuitable condition to float in the air. Second, that the nostrils, which are quite as much exposed to the influence of the breathed-in air as the lungs, are much less frequently affected, and an outbreak in them is almost always secondary to one in the lungs. Also, the supporters of the inhalation theory ignore, or have not considered, the significant fact that only in extremely rare cases does glanders affect the respective mucous membranes of the eyes, vagina or penis, all of which would be more or less constantly exposed to bacilli-laden air. Some years ago, there were veterinary surgeons in South Africa who believed that Cape Horse Sickness (p. 477) was transmitted by means of inhalation, because "there are many cases of horse-sickness in which the lungs are the only organs affected" (*Hutcheon*). Since then, the researches of Edington and others have proved that ingestion is almost always the means of communication, and that inhalation plays little or no part in the production of this disease. These considerations suggest, at least to me, the conclusion that the comparatively high susceptibility of the lungs to an attack of glanders, is due, not to the air which they inspire, but to a special power which they appear to possess, of arresting the passage, through them, of glanders bacilli that are in the blood. The assumption that the lungs have this special power of retention is strengthened by the fact that even in farcy, they are very rarely free from these microbes, and that the heart is seldom if ever affected. The spleen, which is largely concerned in the changes undergone by the red and white corpuscles of the blood, probably possesses this power of retention to some extent; because, next to the lungs, it is the internal organ which most frequently suffers from attacks of these organisms.

The question as to the action of air as a carrier of glanders can be settled only by very extended and elaborate experiments. We have the fact that horses in the same stable as one or more glandered animals, have frequently contracted the disease, although their stalls were at a considerable distance from those of the affected ones, and no apparent possibility existed of the disease having been communicated by contact, either directly or indirectly. Against this supposition, Mr. Hunting remarks: "If the air of a stable carried infection diffused through it, we should certainly have found glanders more commonly amongst horse-keepers. Not many years ago, there were stables in which every horse was glandered, and yet the human tenants who spent twelve hours a

day in the stable escaped infection. We may safely disregard inhalation as a method of infection."

2. By *ingestion*, namely, along with the food, drink, or objects taken into the mouth, or touched by the organs of the mouth. Nocard, Trasbot, Hunting and other leaders of veterinary opinion strongly favour the ingestion theory, in support of which we have the undeniable fact that the discharges of glanders are virulent, and that they frequently contaminate objects which healthy horses are liable to take into their mouths or lick.

3. By *inoculation of a wound or mucous membrane.* When such inoculation occurs, it is an almost certain means of communicating the disease; but "it is now uncommon. In the days when farcy was treated, and warm fomentation of running sores and swollen legs was adopted, it was not uncommon to see cases where wounds were inoculated by sponges, etc., which had been used on diseased horses" (*Hunting*).

"Contrary to the case reported by Babès, Nocard failed to make the bacilli of glanders penetrate the uninjured skin of donkeys and guinea-pigs, by the inunction of a bacilli-containing ointment" (*Friedberger and Fröhner*).

4. By *transmission to the fœtus*, by means of the blood of the dam (Friedberger and Fröhner).

5. I venture to suggest that flies are a probable means of transmitting the disease, which is a point that experiment has not cleared up. In some cases, horses which have open wounds, such as those that have been recently castrated, appear to be much more susceptible to the contagion than those whose skins are intact. This is also a point which experiment can alone decide.

Two other possible modes of infection are by *copulation* and by *drinking the milk of an affected mare.*

TRANSMISSION OF GLANDERS FROM ONE HORSE TO ANOTHER.—In considering this question we must bear in mind that the disease can be communicated only by the bacilli of glanders, and that, as far as we know, these organisms leave the body of an infected animal only in diseased discharges such as those from the lungs and from farcy buds. Experience amply proves that horses which are thus clinically affected are a much more dangerous source of contagion, than those which suffer from the disease, but which have no outward symptoms. As it is impossible to say with certainty that any particular infected horse does not at times discharge the microbes of glanders from its nostrils or other passages, we must regard all horses which react to mallein (p. 614), as probable centres of infection that ought not to be allowed in the vicinity of healthy animals.

CURABILITY AND TREATMENT OF GLANDERS.—Mallein has probably a curative effect in cases of glanders (p. 619). It is also possible that spontaneous recoveries may take place, especially when the animal's constitution is fortified by good feeding, and careful nursing. Mr. Hunting ("Vet. Record"), referring to pre-mallein days, remarks: "Cases were not unfrequent in which horses exhibited well-marked clinical signs of glanders (usually farcy sores, but sometimes nasal ulceration and frequently enlarged submaxillary glands), but after rest and treatment, so far recovered as to return to work free from all suspicious symptoms, and to live until accident or other disease put an end to their existence." Although the treatment of horses which have outward symptoms of glanders, is illegal in this country; there are no restrictions as to the treatment of those which simply react to mallein. If such an animal was worth the trouble and slight risk, it would be wise to continue the injections of mallein, say, at intervals of three weeks, and with comparatively large doses of this drug (p. 615). Mr. Hunting states that "nearly 50 per cent. of the reacting horses submitted to repeated mallein injections recovered."

DISTINGUISHING GLANDERS FROM OTHER DISEASES.—The following are the chief means for arriving at this end:—

1. *Mallein* (p. 614 *et seq.*), is our sheet anchor for preventing us from falling into mistakes concerning the presence or absence of glanders in a suspected animal.

2. *Symptoms.* The chief outward symptoms of glanders are: discharge from the nose; ulceration, on one or both sides, of the mucous membrane which lines the nostrils; and a tumour which is generally adherent to the bone, on one or both sides of the space between the angles of the lower jaw. The discharge from the nose in cases of glanders, differs from that of cold in the head (p. 369), influenza (p. 461) and nasal gleet (p. 373), as my readers may see on referring to the respective descriptions of the symptoms of these diseases. Ulceration of the nostrils is not a frequent symptom. In influenza there may be a swelling, more or less resembling that of glanders, of the glands between the angles of the lower jaw.

A persistently high and varying temperature, ranging, say, from 101° F. to 103° F. and continuing thus for several weeks, tends to corroborate evidence of the existence of glanders.

Horses which come from a glandered stud should be viewed with great suspicion, especially if they evince a tendency to shiver or have rough staring coats. Here, the clinical thermometer (p. 681) will be of great use in arriving at a correct conclusion.

The outward symptoms of ulcerative lymphangitis (p. 505) and epizootic lymphangitis (p. 503) are practically identical with those of farcy, and an exact distinction can be made only by means of mallein or a high-power microscope. The fact that farcy has no characteristic symptoms throws doubt on many of the supposed cases of farcy which are said to have recovered. The symptoms of ordinary lymphangitis (p. 506) would not be mistaken for those of farcy by a competent veterinary surgeon. Petechial fever (purpura, p. 517) " is distinguished from acute glanders chiefly by the slight amount of fever that is present, and by the fact that the extensive swellings of the skin are never nodular" (*Friedberger and Fröhner*).

3. *Inoculation by the discharge from the nose or from a supposed farcy abscess of the suspected animal* would as a rule decide the question fairly well, within three weeks or a month. As glanders in donkeys is generally of a well-marked and virulent type, these animals are fit subjects for such an experiment, which should not be made, unless the stake at issue was of sufficient importance to justify the cruelty, and unless the law respecting vivisection was not violated.

4. *Hastening the development of the supposed disease* by giving the animal 15 grains of bichromate of potash for two or three days in its food; or a full dose of aloes, which should be administered by a stick or balling pistol, so as to avoid accidental inoculation.

5. *The Microscope.* This method can be employed only by those who have studied bacteriology.

I do not think that the appearance of tubercles in the lungs of a horse (pp. 493 and 496) is sufficiently distinctive in cases of glanders, to warrant us in accepting it as proof of the existence, unless we found the bacilli of glanders in these nodules.

PREVENTION.—This is a question which particularly concerns the owners of large studs of omnibus, tramway, cab, and city cart horses; for these animals are more exposed to the contagion than horses of a better class, and are largely recruited from infected areas. Commercial horses in cities are specially exposed to this infection, and it is no uncommon thing for a servant in charge of one of these animals to give his master's nose-bag and its contents to a friend and proprietor of a glandered horse, for a " drink " or its equivalent in money. Owners in question should not buy foreign horses or those coming from such infected centres as London and Glasgow, without having the suspicion of glanders removed from them, by having them tested with mallein.

When taking a horse by train, it is advisable to keep a muzzle or nose-bag on him, because it is probable that glanders has not

unfrequently been communicated by the mangers of railway boxes which had previously carried a glandered animal.

Respecting the spread of glanders by *public water troughs*, Mr. Hunting writes as follows:—"It is quite possible that some cases of glanders have arisen as the direct effect of drinking at a public trough, but they are very few and far between. I have an intimate knowledge of the stables of three contractors who have had, during the last twenty years, four outbreaks of glanders in their studs. Each outbreak was clearly and directly traceable to the purchase of a horse from an infected stud, and was stamped out at once without spreading. Save these outbreaks, no glanders has troubled them, and yet their horses travel all over London, and drink at any water trough they can reach. I feel convinced that infection from water troughs is very rare, because in 90 per cent. of all outbreaks which I have personally investigated, other methods of infection were traceable. Even if 5 per cent. of all outbreaks in London were traceable to the water troughs, the gravity of the harm would be no argument in favour of closing the troughs, especially in summer. The harm resulting to horses from being denied water all day, would cause a mortality greater than is caused by all the glanders in the metropolis."

When engaging new premises, especially in large cities, it is advisable to be sure that they are free from the contagion of this disease.

ERADICATION OF GLANDERS.—The teaching of McFadyean, Nocard, Hunting, and other authorities show that Government should adopt the following rules, the first of which is the only one in force:—

1. *To slaughter all horses which have outward symptoms of glanders* (p. 500), and to thoroughly disinfect the stable or enclosure occupied by such animal or animals.

2. *To test with mallein all in-contact horses*, namely, those which are in the same stable, field or other place as a glandered horse.

3. *To quarantine all reacting horses*, and to submit them to further mallein tests, with intervals of time which should not be less than three weeks. A clean bill of health should not be given to any tested horse, until it has ceased to react, preferably on two consecutive occasions. Although it would be the safer plan to keep the reacting horses entirely isolated, the small risk of allowing them to go out and work might be disregarded, on condition that they were not to enter any stable except their own.

The following additional rules would greatly help the good work in question:—

4. *Compulsory notification by veterinary surgeons* of all cases

of glanders and of all reacting cases seen by them in their respective practices.

5. *To prohibit the use of mallein*, except by veterinary surgeons and medical men. If these two rules were made law, they would greatly help to check the spread of glanders, by preventing to a considerable extent the sale of reacting horses, which in all cases are a source of danger. Professor McFadyean ("Journal of Comparative Pathology," Dec., 1897) wisely remarks: "Glanders at the present time is mainly spread from stable to stable not by the traffic in clinically glandered horses, but by the sale and purchase of horses that have the disease in an occult form, and no plan which fails to take note of this fact is deserving of serious consideration."

Epizootic Lymphangitis

(*Neapolitan or Benign Farcy*).

NATURE.—This disease, which was first described by Rivolta in 1873, is a specific and contagious form of lymphangitis, and appears to be confined to horses, donkeys and mules. It is well known in Italy, Algeria, France, Egypt, Guadaloupe, and other temperate and torrid lands; but it cannot exist in cold countries. Dr. Lingard recognised it in 1899 among horses at the Indian Remount Depots of Karnal and Hapur, where it had been mistaken for farcy, with the result that many remounts were needlessly destroyed, although tests with mallein (p. 614) gave negative results. In this case, it had been imported by mules from Italy.

CAUSE.—This disease is due to a microbe, the *cryptococcus farciminosus* of Rivolta, which is about one six-thousandth of an inch in diameter. When pus from a freshly-opened abscess is microscopically examined with a power of 400 or 500, these organisms appear as "rounded bodies with somewhat pointed ends, or one end pointed and the other rounded, highly refractile and presenting a double contour. At first sight one is immediately reminded of the likeness of this organism to the *coccidium oviforme* so frequently observed in the liver of the rabbit, or of a yeast cell, *sacchromyces*" (*Lingard*).

SYMPTOMS, COURSE, PERIOD OF INCUBATION AND MORTALITY.—The symptoms of this disease are extremely like those of farcy, from which, however, it can be clearly distinguished by the microscopical examination of the organisms, and by the fact that mallein produces no reaction in horses which are suffering from it.

"This disease developes from wounds, after a period of incubation of about three months. Multiple abscesses accompanied by

lymphangitis appear round the affected part in and immediately under the skin. These abscesses form nodular new-growths which are seen later on in the lymph glands, connective tisue of the muscles, bones, and even in the conjunctiva, and which undergo a slow process of suppuration. In the skin they subsequently change into fungoid ulcers. The mortality amounts to about 10 per cent. With energetic treatment, a cure takes place in from one to seven months" (*Friedberger and Fröhner*). A well-marked feature of this disease is the presence of prominent and hard lymphatic vessels.

Dr. Lingard gives the following interesting account of symptoms which he observed in cases of this disease :—

"The patient (a mule) presented a chain of abscesses connected by corded lymphatics starting from the shoulder and running up the neck following the course of the jugular vein. This animal was destroyed. Local lesions only, all internal organs presented a perfectly healthy appearance.

"Mule. Fluctuating swellings were observed running up the inside of the arm. Destroyed. Local lesions, internal organs healthy.

"Mule. This animal presented several small fluctuating tumours on the right side of the chest, over the ribs, and a thick corded lymphatic proceeded from the root of the neck and ran down between the fore legs, from before backwards along the under surface of the abdominal wall. Destroyed. Local lesions, internal organs presented a perfectly healthy appearance."

He found four horses and nine mules "presenting small tumours and open wounds on different parts of the body, associated in some instances with swellings varying in size from a small walnut to that of a hen's egg, from which corded and beaded lymphatic vessels issued. Whilst in others, tumours were observed which on manipulation were found hard and fluctuating according to the stage which they had attained. In the majority of cases the lymphangitis had made its appearance on a level of a pre-existing wound of little importance, abrasion of the skin, or harness gall, etc., which had healed for some time, may be for months, and had broken out afresh on the original site, or pustules appear in close proximity to the cicatrix. In more advanced cases, considerable areas of the skin covering the ribs, front of the chest, side of the head or limbs were involved, and one animal presented a fair-sized ulcer (as large as a sixpenny piece) on the nose."

Cadiot and Ries remark that tubercles are never found in the lungs of animals affected only by this disease.

TREATMENT.—With reference to the occurrence of this disease in India, Dr. Lingard states in his "Annual Report" for 1900-1901,

"that experiments conducted at Muktesar have shown that a cure can be affected by removing animals to a high level, 7,500 feet elevation, a result which agrees with the fact that the disease in Europe disappears above a given line of latitude. As the development of the disease occupies several months, this measure can easily and usefully be adopted in the case of valuable remount animals."

The surgical treatment of epizootic lymphangitis consists of opening the abscesses, cleaning and scraping them out, and freely using strong antiseptics (p. 67) and the firing iron.

Ulcerative Lymphangitis.

NATURE AND CAUSE.—In the "Annales de l'Institut Pasteur" for November, 1896, Nocard describes a form of lymphangitis, the symptoms of which are similar to those of farcy; although patients affected only by it give no reaction to mallein. In these two respects it resembles Rivolta's epizootic lymphangitis (p. 503), from which, and also from farcy (glanders) it can be distinguished by a microscopical examination of its disease-producing organisms. These microbes, which are found in large numbers in the pus issuing from a recently-opened abscess of this disease, are short thick rods which have rounded ends and which are generally placed parallel to each other, although sometimes they may be arranged in lines. They differ from the rods (bacilli) of glanders by the fact that they stain by Gram's method, which is a means of differentiation that can be employed only by persons who are conversant with bacteriology. The special organism of epizootic lymphangitis is more or less oval in form (p. 503).

SYMPTOMS.—The disease usually breaks out in one of the legs; the hind being more commonly affected than the fore. The lymphatic vessels of the suffering limb swell and form abscesses which on bursting give rise to deep, unhealthy-looking ulcers on the inside and sometimes on the outside of the leg, which may become swollen and the animal may not be able to put weight on it, or even allow it to rest on the ground. In such cases, pressure on the limb will cause the patient great pain. Abscesses and consequently ulcers may form on the lower part of the body. Sometimes the abscesses and the corded condition of the lymphatics disappear and the ulcers heal up in the summer, only to come on again during the next cold weather. Recovery may take place spontaneously, or the attack may continue for several years. Nocard lays great stress on the fact that in all the cases which he has seen, the lmyphatic glands of the groin of an affected limb never became

hard or had abscesses, although occasionally they might become somewhat enlarged.

Fig. 146 shows the near hind leg of a horse in South Africa which was suffering from this disease. The inside of the leg was ulcerated in a manner similar to the outside of the limb.

Post-mortem examination often shows that suppuration has extended to the kidneys, but never to the liver, spleen or lungs.

TRANSMISSION OF THE DISEASE.—Ulcerative lymphangitis is probably communicated by contagion only from one animal to another. Nocard considers that it is not very readily transmitted, and that consequently it is not a particularly dangerous disease.

TREATMENT.—Antiseptic treatment applied to the ulcers or to the interior of the abscesses after they have been opened, is often followed by rapid healing, which produces only a temporary good result, for the disease may re-appear at any time in other places.

Weed (*Lymphangitis*)

is a condition of the system characterised by inflammation of the lymphatic glands of one, or more, of the limbs.

The usual CAUSES are over-feeding on nutritious food; a change of food—especially one of "green meat"—given in a large quantity; and neglect of regular exercise. Errors of food and want of exercise are, generally, combined in the production of this disease. Wounds of the feet sometimes give rise to a form of this complaint.

NATURE OF THE DISEASE.—Besides the arteries, capillaries and veins, which are essentially concerned in the conveyance of blood, there is another system of vessels called the lymphatics, the function of which is to take up nutritive material from the intestinal canal, and, also, to remove waste products from the tissues. The lymphatics somewhat resemble the veins; as they are, at first, very minute, and, then, gradually enlarge. In health, the superficial lymphatic vessels are not outwardly apparent to the eye; but, when irritated, they become swollen and painful. In the hind leg, which is the usual seat of this disease, they follow the course of the great saphena vein which runs up the inside of the hock and thigh. Exercise quickens the circulation of the fluid (lymph) which flows through the lymphatics; but want of work naturally tends to retard it. When lymph stagnates—if I may use the term—in the lymphatics, especially, if the horse, for some time previously, has been fed on highly nutritious food, it is apt to cause irritation in the glands through which is passes. It is not improbable that, owing to its retention in these vessels, the lymph undergoes some unhealthy change. When an animal has been fed on highly nitrogenous food, the waste products of the tissues will be much more unstable in their composition than they would be were the percentage of nitrogen less. Again, we are aware that the circulation of both blood and lymph in the limbs of the horse—especially in the hind

extremities—is peculiarly dependent on exercise. Hence, the probable reason for lymphangitis appearing in the extremities; for its selecting the hind limbs in preference to the fore ones; and for its being induced by idleness and high feeding. Why it should occasionally occur, as it is said to do, while an animal is in a starving condition, though doing no work at the time, is somewhat difficult of explanation. Perhaps the lymph, when no food has been given for some time, becomes abnormally rich in nitrogen. I can offer no explanation as to the preference exhibited by this disease, according to good authorities, for the near hind leg, rather than for the off one.

Fig. 146.—Ulcerative lymphangitis.

Owing to the existing inflammation, a large quantity of fluid escapes from the vessels into the adjoining tissues, and gives rise to the swelling. This fluid has a strong tendency to become consolidated unless it is promptly removed by the lymphatics and smaller veins, whose power of doing so is held in abeyance as long as they remain inflamed. Hence, the advisability of reducing the inflammation as quickly as possible, and of endeavouring to prevent its recurrence.

The fact that two other kinds of lymphangitis (pp. 503 and 505)

are caused by specific micro-organisms, suggests the probability of this form of lymphangitis being also infective.

This disease is generally confined to cart-horses.

SYMPTOMS.—The inflammation is usually limited to one hind leg, the near one, as a rule; although, in rare cases, both may become affected. Or it may appear in a fore leg, usually the off fore, according to Williams. The exceptional cases in which the disease occurs in front, are much milder than when in the hind extremities. There is great lameness. The attack is preceded by a shivering fit or cold stage; hence, the common designation "shake." The severity of the rigor is always proportionate to the duration of the attack. This stage, as in ague, is followed by a hot period, with high fever, frequent, hard and full pulse, and great pain of the affected part. The horse "blows," that is, he breathes as he would do after violent exercise. The glands, at the groin, or at the elbow, as may occur in exceptional cases, swell. The swelling extends downwards, as far as the foot; but in farcy it extends upwards. There may be dropsical swellings about the sheath and under the belly. The hot stage is terminated by sweats breaking out over the body. When the swelling subsides, the inflamed lymphatic vessels of the leg appear clearly defined like enlarged veins; hence, the term "weed," from their supposed resemblance to a vegetable growth. As the complaint, when it occurs, appears generally after a short period of idleness; it has in some places received the name of "Monday morning disease." As a rule, lymphangitis takes from one to two days to become developed; the severity of the symptoms remains unchanged for a like period; and then it slowly and gradually decreases, although the affected limb will, especially after two or three attacks, rarely recover its original size.

This disease has a marked tendency to recur.

After repeated attacks, the limb becomes permanently enlarged —an incurable condition termed "elephantiasis."

TREATMENT.—At the first appearance of the disease, give as a purgative, a subcutaneous injection of eserine and pilocarpine (p. 609), or a full dose of aloes, in ball or drench; and keep the animal on a short supply of food, allowing him only a little laxative diet, such as green grass, roots, and bran mashes. Bathing the part with warm water and applying warm fomentations are indicated by the fact that, as the swelling increases, the pain and lameness diminish. During the intervals in which the leg is not fomented, keep it smeared over with extract of belladonna, made up with gum or a little glycerine, to render it adhesive. While the cold stage lasts, have the animal warmly clothed. Give, after the first day or two,

an ounce of nitre in the food or water, daily, for a week. If the sheath be swollen, the penis should be withdrawn, the sheath well washed out with soap and warm water, and afterwards lubricated with sweet oil or vaseline. The back of the hand should be oiled, before the hand is introduced into the sheath. If these measures do not reduce the swelling, the sheath should be punctured; for a distended condition of that part may prevent free urination. The affected leg should be neither blistered nor fired; though we may endeavour to reduce its size by hand rubbing; by the pressure afforded by an elastic or flannel bandage; or by the application, from time to time, of the ointment or tincture of iodine. The horse should on no account be worked, or even taken out of his stall, until all inflammatory symptoms have subsided. After an attack, great care should be observed as to his feeding and exercise; for the disease has a strong tendency to recur, and, by doing so, to cause a permanent thickening of the limb.

If abscesses form, they should be freely opened with the knife.

Colonel Fred Smith advises that during the inflammatory stage, no time should be lost in freely scarifying the affected limb, and then bandaging it, so as to favour the escape of the fluid portion of the blood, which is the cause of the swelling and of the subsequent enlargement of the leg.

Bleeding (from the jugular vein) in this disease, should on no account be resorted to; for, if practised, it will increase, to a high degree, the tendency of the affected limb to become chronically enlarged; although it may apparently, for the time, be of benefit in alleviating the acute symptoms.

The subsequent feeding and exercise of the patient should be carefully regulated.

It is quite useless to attempt to treat an old case of swelled leg which has been induced by attacks of this disease.

On account of its recurrent nature, a horse which has been known to have had this disease, should not be passed sound.

Tuberculosis

is an infective disease due to the presence, in the system, of a specific disease germ (the *bacillus tuberculosis*), which gives rise to tumours of various sizes in the internal organs. Owing to the fact of these tumours entering into and destroying the tissues in which they are located, the affected animal wastes away and dies. In advanced cases, there is generally very profuse urination. It appears to be in the horse, as in man, a very fatal disease, for which there is no cure. In human beings it is known as consumption. It is a comparatively rare disease in horses.

In the large majority of cases of tuberculosis in the horse, the infection appears to have been brought in cows' milk, with which the affected animals have been fed. Hence, as a great rule, this disease attacks only young horses. Tuberculosis is very common among horned cattle. If horses, and especially young ones, be fed either wholly or in part on cows' milk, the precaution of heating it to at least 175° F. should be observed, so as to destroy any bacilli of tuberculosis which may be in it. This pasteurization of milk can best be effected by a special apparatus which costs from £20 to £30.

Except when artificially cultivated, the tubercle microbe does not multiply outside the animal body; and although it will live for some time (say, up to a year under very favourable conditions) apart from its "host," it is essentially an animal resident. In the horse, these germs gain entrance into the system generally with the food or drink, and make the alimentary canal their first point of attack. They are then carried in the blood-stream to various internal organs—such as the lungs, liver, spleen and brain—where the inflammation to which their presence gives rise, causes the formation of tubercles, which present two different appearances, though of the same nature, namely, small nodules (miliary tubercles) and diffuse tumours. Although they generally keep between the limit of size of a pin's head to that of a greengage; they may be as big as an ostrich's egg, or even larger. The tissue, with its small blood-vessels, becomes destroyed at the seat of the formation of a tubercle, so that this new growth, being unprovided with blood, dies, breaks up into soft cheese-like material, and finally is converted into earthy matter, or into a small fibrous nodule. In this manner, these microbes gradually destroy the tissue which they invade, and give rise to general decay, and special symptoms, according to their point of attack. For instance, the presence of tubercles in the brain will, as a rule, be followed by signs of mental disturbance. The tumours which are found, not very uncommonly, in the spleen and brain of horses, are in the large majority of cases, of tuberculous origin. In a horse infected with tuberculosis, there is increasing weakness, loss of condition, paleness of the mucous membranes, and an excessive flow of watery urine. *Post-mortem* examination shows that the spleen and glands of the mesentery are considerably enlarged. Without a microscopical examination, it is impossible to decide the question whether or not a horse has died from tuberculosis. McFadyean has demonstrated that the tumours in the spleen, which were formerly ascribed to lymphadenoma, are those of tuberculosis.

Dourine (*Covering Disease*, *Mal du Coït*).

I have compiled the majority of the following remarks on this disease from Friedberger and Fröhner's "Pathologie," and from Cagny and Gobert's "Dictionnaire Vétérinaire."

DEFINITION.—Dourine is a specific disease which at first appears as an inflammation of the surface of the genital organs, and which causes grave alterations in the nervous system of the attacked animal. Under natural conditions, it is confined to the horse, ass, and their hybrids; although it can be conveyed to dogs and other animals. It runs either a chronic or acute course,

the former being more common than the latter. Mares are more liable to acute dourine than stallions.

GEOGRAPHICAL DISTRIBUTION.—It was first observed in Germany by Ammon in 1796, and has since that time spread to a greater or less extent, through Germany, Austria, Russia, Italy, France, Algiers, Syria, and America. As far as I have been able to learn, it is unknown in Great Britain, Ireland, the Indian Empire, China, and Australasia. Röll states that it is not met with in Belgium. "Dourine appears on rare occasions in the South of France, and is frequently met with in Spain and Algeria" (*Cagny and Gobert*).

MODE OF PROPAGATION.—It is a purely contagious disease; that is, it can be transmitted only by contact, and under all ordinary circumstances, only during the act of coition, from stallion to mare, and *vice versâ*. The inoculation of fresh blood is the most effective means of transmitting dourine.

NATURE OF THE DISEASE.—In 1896, Dr. Rouget showed that dourine is a true infective disease caused by a trypanosoma which is closely akin to the parasite of surra (p. 457).

PERIOD OF INCUBATION.—"On account of the chronic course of the disease, the infective matter may remain apparently latent in the system of a horse for a very long time, even for more than a year" *(Friedberger and Fröhner)*.

DURATION AND CHANCES OF RECOVERY.—"The duration of the attack may vary from eight months to one or two years, and recovery is rare. In male and female donkeys, the disease runs a very slow course, and is seldom fatal" (*Cagny and Gobert*). Not unfrequently an apparent recovery is followed by a relapse and death.

CHANCES OF RECOVERY.—The mortality is at least 70 per cent.; and is greater in stallions than in mares.

SYMPTOMS.—The symptoms of chronic dourine may be divided into local and general; and the attack, into three periods.

First period.—From eleven to twenty days after the stallion has covered an infected mare, the first symptom to appear, is swelling of the penis and particularly of the head of the penis, which, on this account, cannot in some cases be drawn back into the sheath: a complication that may also happen after castration. The swelling spreads from the penis

to the sheath and scrotum, and the testicles and the glands of the groin become inflamed. There may be red spots, vesicles, and ulcers on the outer surface of the penis. The orifice from which urine is discharged (*meatus urinarius*) is red, swollen, and shows a slimy discharge. During the progress of the disease, these local changes may entirely disappear. The patient suffers from strangury (p. 442) and often from sexual excitement. His appetite continues good, although he falls away in condition; and his loins become very sensitive to pressure.

In the mare, the surface of the genital organs is generally swollen, thickened, more or less studded with red spots, gelatinous elevations, vesicles, and ulcers, and covered with a muddy orange-coloured secretion. As in the horse, the local changes in the mare may be insignificant. Usually, the clitoris is swollen and erect, and the mare suffers from excessive sexual excitement, and strangury. She discharges urine in small quantities at a time, or a slimy discoloured secretion (mucus). She keeps whisking her tail about, is very ticklish, and constantly "horses." The urine and mucus from her genital organs soil the tail and thighs, and may scald the skin of the parts upon which they lodge. The swelling and inflammation of the vulva and vagina may extend to the udder and lower part of the belly.

Second period, or *period of wheals.*—Between the fortieth and sixtieth day, the patient, especially if it be a stallion, generally gets an attack of nettle-rash which takes the form of sharply-defined, round, flat eminences, which may be raised about $\frac{3}{4}$ of an inch above the surface of the skin, and which may vary in size from that of a shilling to that of the palm of the hand. These eminences may appear or disappear very rapidly, and may change their position from time to time. The hair over them stands on end, and the skin which covers them is unusually thick. As a rule, they persist for several weeks, during which time they become moderately hard, and then slowly disappear. Their favourite sites are the croup, neck, shoulders, chest, and belly. Cagny and Gobert regard these wheals as characteristic of dourine. Occasionally, no wheals appear, and flat patches of skin on which the hair stands on end, take their place. Sometimes there is intense itchiness (pruritis) of the skin, which is manifested by the animal rubbing and biting itself, so that extensive sores on the skin are produced. The mucous membrane of both stallion and mare often show white spots, which correspond to the positions previously occupied by ulcers that have healed. The lymphatic glands are often swollen all over the body. The animal gets lame behind, on account of inflammation of the joints and tendons. At this period, affected stallions are

unable to cover, and affected mares miscarry, if they are in foal. In the acute form, sudden paralysis sets in after the primary swellings, and death ensues in a few days.

Third period.—In both stallion and mare, the general symptoms may develop only after several weeks or even months, and may defer their appearance until the local symptoms have passed off. The first general symptoms are those of depression and weakness, and inability to control the movements of the limbs, especially those of the hind ones. Emaciation and symptoms of paralysis become more and more pronounced until the animal is no longer able to get up off the ground and dies from exhaustion, blood poisoning, or inflammation of the lungs.

POST-MORTEM APPEARANCES.—We find in various parts, infiltration of serous fluid and softening, especially in the testicles and spinal canal.

DISTINGUISHING DIAGNOSIS.—The only disease for which dourine may be easily mistaken, is an inflammation of the skin and mucous membranes which is known to veterinary surgeons as vesicular exanthema, and which somewhat closely resembles horse-pox. The benign character of the complaint and absence of constitutional disturbance will distinguish either vesicular exanthema or horse-pox from dourine.

TREATMENT, to have any chance of success, should be undertaken in the very earliest stage of the disease. We may frequently apply to the sore parts some suitable antiseptic lotion, such as creolin or carbolic acid (p. 67). Lingard's treatment of surra by arsenic (p. 459) should be tried.

Opinions are divided as to the efficacy of castration as a means of cure.

SANITARY MEASURES.—Owing to the insidious nature of the disease, and the small chance of effecting a cure, it is advisable in most cases to destroy the animal; although we might try castration in the case of a stallion which was but slightly affected. An animal that has once manifested the disease should on no account be again used for breeding purposes; because, not unfrequently, apparent recovery takes place in animals in which the seeds of the disease remain dormant for the time being, only to develop later on with renewed vigour. The literature of the subject gives us many instances of the use of an apparently recovered stallion being the cause of the wide dissemination of dourine.

The "Veterinary Record" of 24th March, 31st March, 14th April, 12th May, and 19th May, 1900, contains a translation of an admirable paper on dourine by Surgeon-Major Schneider and Veterinary-Surgeon Buffard of the French Army.

Horse-Pox (*Variola Equina*)

is a rare disease which appears to be identical with the cow-pox of cattle. Its effects are mild, and, in themselves, entirely free from danger to the life of the animal. Unlike the small-pox of man, it can be transmitted only by contact. The watery fluid contained in the vesicles of horse-pox acts like that taken from the cow, in guarding persons from small-pox. Cattle suffering from cow-pox appear capable of infecting horses with horse-pox; and *vice versâ*. There seems to be no difference between horse-pox and pustular stomatitis (p. 409), except that the effects of the former are confined to the mouth and neighbouring parts of the head; those of the latter being more or less general.

In variola, under which general term, horse-pox, cow-pox, and small-pox of man are classed, there is a definite course of the following stages: (1) fever lasting about two days; (2) an eruption of pimples, which in from ten to fourteen days successively turn into (3) vesicles (pimples containing clear fluid), (4) pustules (pimples containing pus), and (5) scabs, due to the drying up of the fluid in the pimples. The disease runs its course in about a month from the time that the animal receives the virus, until the scabs fall off. When the legs are much affected, they may continue swollen for a month or two longer.

The fever preceding the eruption is often so slight that it does not attract attention. The pustules have the characteristic appearance of variola, in that they are depressed in the centre, and have a red circle round each of them. They are, usually, confined to the legs below the hocks and knees, but may also appear on the shoulders, back, mouth, nostrils, and other parts. When the eruption is on the legs, it is generally confluent (running together), and resembles, to some extent, grease, from which it may be distinguished by the character of the vesicles (pimples filled with serum), and pustules (pimples filled with pus), and by the fact that the scabs of the pustules adhere, principally, by means of the hair. The sudden and transitory nature of an attack of horse-pox is very different from the gradual and lasting one of grease. The sores left after the scabs of horse-pox are generally very superficial; they heal rapidly, with little or no scar; and do not affect the lymphatics: conditions which distinguish this disease from glanders and farcy. The eruption may cause swel-

ling of the legs, and inflammation of the mucous membrane of the mouth.

TREATMENT consists in keeping the animal on green and laxative food; and giving $\frac{1}{2}$ oz. of nitre in the mash or water, every second day or so. If the mouth is sore, it may be washed out, from time to time, with a strong solution of borax or alum in water.

Diabetes Mellitus.

In this disease, an abnormal amount (as much as 5.85 per cent. in a case observed by Werner) of sugar is found in the urine. Friedberger and Fröhner state that 3.75 per cent. is an average quantity in this complaint. Although only a very few cases have been observed in Europe; Nunn and Blenkinsop say that it is not uncommon among horses in India.

NATURE.—The appearance of grape sugar in the urine can be brought about by, among other causes, (1) mechanical irritation by blows and wounds on certain portions of the brain and spinal cord; (2) by drugs that, like morphia and chloroform, excite the brain; (3) by removal of the pancreas; and (4) excessive secretion of grape sugar by the liver (p. 538).

This presence of sugar may be only a temporary condition, or may be continued, in which case it will be the characteristic symptom of a disease that seems to be almost always fatal in about a couple of months' time. The symptoms, excluding that of the presence of sugar, closely resemble those of diabetes insipidus. Ulceration of the cornea sometimes occurs in the late stages of the disease. Treatment appears to be of no avail.

Diabetes Insipidus (*Polyuria, or Profuse Staling*)

is a disease characterised by a continued and excessive flow of watery urine of low specific gravity, and by consequent thirst. The conditions which give rise to this state, appear to have little or no connection with the well-being of the kidneys. We know that irritation to a certain portion of the brain (the rhomboidal sinus near the centre of origin of the pneumogastric) is accompanied by profuse staling, though we cannot exactly say how this is brought about. It is not improbable that disease germs which are contained in musty forage and which appear to give rise to polyuria (*i.e.*, much urine), may, after being received into the circulation, manufacture products which irritate the nervous centre in question. In other cases, the fact of the blood being in an altered condition from disease, errors in diet, etc., may render it liable to encourage the development of

ferments or other morbid material, the presence of which in the blood may also disturb the nerves that supply the vessels of the kidneys. Or, the agencies at work, whatever they may be, may effect their purpose by causing the watery portion of the blood to escape with undue rapidity from the arteries of the kidneys. The tendency to dropsy often met with in this disease, seems to favour the view that the fault, at least in some instances, lies in the state of the blood.

This disease, as a rule, is of a mild type.

CAUSES.—Improper forage, such as musty hay and corn; feeding on boiled food for a considerable time (Williams); debility; exposure. It may accompany indigestion, tuberculosis, and other disorders.

SYMPTOMS.—Both the thirst and the amount staled are excessive; the urine is watery and of low specific gravity; the pulse weak; coat, rough; gums, pale; breath, sour-smelling; appetite, depraved, and often voracious; bowels, costive; dung, usually, dark in colour and of a bad smell; and the animal is prone to sweat after slight exertion. There is rapid loss of condition, and general debility. Sometimes, there are dropsical swellings.

TREATMENT.—Give a mild dose of aloes; change the nature of the food; instead of water, allow the animal a copious supply of linseed tea to drink; mix in the food 2 oz. of bicarbonate of soda daily. If these simple measures do not succeed, give daily in a ball, soon after feeding, 2 drachms of iodine for six or seven days, exercising judgment in diminishing the iodine as the thirst and amount staled decrease, and mix in the food or water, daily, 1 oz. of the hyposulphite of soda. Owing to the irritating effect of iodine, it should not be administered when the stomach is in an empty condition. The animal's drink should on no account be curtailed in this disease.

Evans advocates the use of clay water, which is made by mixing yellow clay with water, and after the sediment has been deposited, giving the solution to the animal to drink, instead of plain water. The bicarbonate of soda, however, seems to act equally well, and is the cleaner and more manageable agent of the two.

Iodine appears to act, here, as a powerful diffusible antiseptic in checking the development, in the blood, of morbid material; and, also, as an eliminative. Its almost specific (if I may use the term) action, in this disease, was first discovered by Dick. Bicarbonate of soda and linseed act as sedatives. Hyposulphite

of soda checks, to a marked degree, putrefactive changes in the blood; and, also, during constipation, neutralizes the foul gas given off by the residue of the food which is in the intestines.

Robertson describes a dangerous form of diabetes insipidus, in which the urine is dark coloured, thick, and of high specific gravity, owing to the presence of a peculiar form of albumin. There is rapid wasting, followed by paralysis and coma.

Excessive urination after diseases of the organs of breathing, should not be interfered with; for it is an effort of nature to get rid of the effete matter which is taken up by the blood, on the products of the previous inflammation becoming broken up. The waste matter with which the blood is loaded, irritates the kidneys and gives rise to the profuse staling.

Purpura Hæmorrhagica (*Petechial Fever*)

appears to be a grave alteration of the blood due to the introduction into the system of virulent material produced under bad sanitary conditions, or generated within the body during previous illness; or it may be caused by constitutional taint or weakness. As a rule, it follows some debilitating disease, such as strangles, influenza, or catarrh; in which cases, it appears during the stage of convalescence. It is not infectious, it cannot be communicated by inoculation, and no characteristic microbe has been found in horses suffering from it. Up to the present, nothing is known about its cause. It somewhat resembles the purpura hæmorrhagica of man.

NATURE OF THE DISEASE.—We may roughly say that the blood in purpura, is in a more or less decomposed state. The amount of albumin in it is greatly diminished; the red corpuscles are more or less shrivelled and broken up; and the watery constituents show a marked tendency to separate themselves, and, consequently, rapidly ooze through the walls of the blood-vessels; thus producing the characteristic swellings. The infiltration of this fluid into the brain, in excessive quantity, causes insensibility; and into the lungs, suffocation. The fluid which thus escapes, holds in solution a quantity of the colouring matter of the blood, which is obtained from the broken-up red corpuscles, and which causes the various infiltrated tissues to become stained: hence, the name purpura hæmorrhagica. The blood itself is darker than usual, owing to changes undergone by its colouring matter. It also loses, to a marked extent, its property of coagulating.

Whether the blood only is affected, or whether the walls of the vessels are also implicated, are questions which our present state of knowledge does not enable us to answer with certainty.

VARIETIES OF PURPURA.—For practical purposes, we may regard this disease as appearing under two forms, namely, severe and mild.

SYMPTOMS OF SEVERE PURPURA.—The most noticeable

first symptom is prominent swellings, which appear suddenly, and, usually, on the inside of the thighs, below the belly, sheath, breast, and about the mouth and nostrils. The swellings are hard, hot and painful to the touch, though not to a very marked degree. Simultaneously with the swellings, or a few days before them, blood-spots (petechiæ) of a purple or dark red colour make their appearance on the various mucous membranes; and on those portions of the skin which are devoid of pigment. They usually vary in size from that of a flea-bite to that of a shilling, or may be larger; and many run together and thus form large blotches. The amount of fever and increase of internal temperature vary much in individual cases, and during the course of the same attack. The pulse is very weak, there is great debility, and the bowels are generally constipated. If, however, this is not the case, the dung is covered, more or less, with mucus and altered blood. The prominences on the legs soon run together, causing swellings of the limbs which terminate abruptly, as if tied by a cord, on the thighs and fore-arms. The lips and nostrils swell, the distension ending in the same sharp manner as it does on the extremities. The eyelids, also, usually swell. A thin, bloody discharge issues from the nostrils, the mucous membrane of which is darker than usual. The swelling of the head and throat often causes great distress in breathing; and cough is frequently present in such cases. There may be more or less severe sore throat, and inflammation of the lungs, which may become gangrenous. The horse can usually swallow fairly well. The swellings of the sheath, belly, and breast, being due to gravitation of the exuded fluid, generally terminate on the same level as those of the legs. A dark-coloured, irritating fluid oozes out from the swollen skin, tends to scald the parts over which it flows, and dries on them; thereby causing troublesome cracks, which appear chiefly in front of the hocks, and behind the knees and pasterns. Owing to the character of the blood, and, possibly, also to the condition of the blood-vessels of the kidneys, the urine is dark, its specific gravity is high, and it is in a more or less decomposed state.

It sometimes happens that portions of the swollen skin lose their vitality, slough, and leave sores which take a long time to heal.

Remissions in the symptoms are well marked in purpura. The swellings may subside and come on again in the same place or appear in some other part. While the patient is apparently doing well, all the dangerous symptoms may recur suddenly with renewed intensity; or the animal may die without warning.

The characteristic swellings and the blood-spots are the distinguishing symptoms of this disease.

The horse begins to become semi-unconscious, as soon as the

general swelling commences to appear, and he becomes more and more insensible to outward impressions as the attack advances.

Death occurs from gravitation of the watery fluid of the blood into the lungs and other organs, from the blood not being able to perform its functions; from blood-poisoning due to absorption of decomposing matter in the tissues; and from debility.

If the disease does not kill in a few days, it will generally run a somewhat chronic course, perhaps, up to six weeks, during which time, relapses not unfrequently occur.

The MORTALITY of the severe form of purpura is about 50 per cent.

SYMPTOMS OF THE MILD FORM OF PURPURA.—Instead of the diffused and abruptly terminating swellings met with in cases of the severe form of purpura, there are distinct swellings or lumps, the elevation of which may be so slight that their presence might fail to be detected, were it not for the fact that the hair of the skin covering them stands on end. These lumps or patches exude a fluid resembling that contained in a blister. The blood-spots which are found in the nostrils, are of a scarlet instead of a purple colour. The discharge from the nose is not dark in colour. In some cases, there are no swellings; the blood-spots, however, are always present. This form of purpura runs its course generally, in a week to ten days, leaving the patient greatly enfeebled and emaciated. It may degenerate into the other and much graver form. It is a mild affection, except when complicated by severe sore throat, or when the patient was in a state of debility before the attack.

TREATMENT.—Although the nature of this disease is, at present, but imperfectly understood; we are fairly warranted in taking the animal from unhealthy surroundings, in trying to remove the exudation, and in supporting the vital powers. With these objects in view, we should place him under the best possible sanitary conditions and keep up his strength by suitable food and drink. Excellent results have been obtained by the following treatment, which has been invented by Dieckerhoff: Take a solution of iodine 1 part, iodide of potassium 5 parts, and water 100 parts; and slowly inject into the windpipe (p. 635) an ounce of the solution twice a day. In bad cases, the dose may be increased to 2 oz.; and may be proportionately diminished as relief is obtained. It is said that two or three days of this treatment (one injection a day) will usually be sufficient to effect a cure.

With respect to old methods of treatment, I have found the following to be attended with good results. Give—

Oil of turpentine	$\frac{1}{2}$ oz.
Linseed oil	$1\frac{1}{4}$ pint

as a first dose, and then continue giving $\frac{1}{2}$ oz. doses of turpentine in $\frac{1}{4}$ pint of linseed oil, three times a day, if the symptoms indicate the necessity. Give 1 oz. chlorate of potash, daily, dissolved in the drinking water, of which there should be a plentiful supply. From the outset, the strength should be supported by gruel with eggs mixed in it, and by ale or stout, if necessary. If the bowels act freely, the linseed oil may be discontinued, and the turpentine mixed with gruel and eggs as a drench. If constipation be present, administer enemas of warm water. Give green meat and any wholesome food the animal may like to eat. Keep him warmly clothed and nurse him carefully. If the breathing becomes difficult, tracheotomy may be performed, but only as a last resource; for the tissues, if wounded, have a great tendency to slough during this disease. For the same reason, the swellings should not be punctured unless with the object of relieving marked distress in breathing.

Hæmoglobinuria (*Azoturia*).

DEFINITION.—A condition characterised by the excretion of dark-coloured urine, by excitement, and by violent and painful spasms of the croup muscles, usually after a period of good feeding and a few days' rest.

CAUSES AND NATURE.—In England, this disease is almost always due to work after a period of idleness during which the patient has been liberally fed on corn. I have seen it principally among highly-fed cart-horses, and have never observed it in animals which are regularly worked. Many Continental writers regard cold as the chief cause of this complaint; although this is not the case in Great Britain, where the cold is much less severe during winter. Mr. Holmes, M.R.C.V.S., of Bourne ("Veterinary Record" for 29th June, 1901), "knew a horse which had been turned out on a piece of grass-land that was not worth more than £8 an acre, and it had become affected. He was certain that it was not feeding in this case, for the animal had not had any corn for a long time, but it was so bad that it could hardly turn round in its box." In the same journal, Mr. R. W. Clarke, M.R.C.V.S., remarks that it is "easy to understand why this condition should be so common amongst horses in training

either for racing or hunting, and on a cold windy morning it is not an uncommon occurrence for several of these cases—which are known to racing men as 'setfast'—to come under the notice of the veterinary surgeon. Fortunately these cases are not of the most severe nature, and being promptly attended to answer in a short time to treatment. When this condition is observed in agricultural horses—which is a comparatively rare occurrence—it will generally happen during the time that corn is being harvested and the horses are allowed to eat at the sheaves of corn while the waggons are being loaded. Besides which they are chiefly fed on tares which at that time will be ripe and comparatively rich in albuminoid material. Then rain falls and the harvest operations are suspended; the horse stands in the stable for a day or so, and an attack of azoturia may be the result.

"By far the greater number of these cases occur upon the resumption of work after rest, but this is not absolutely necessary, and cases of a mild or chronic form are seen in which no cessation of work has occurred, or in horses which are still at rest, but when this is the case the symptoms are more gradual in their development and differ somewhat from the acute or severer forms of the affection."

Local influences may have some connection with this complaint, which is common in certain places, and almost unknown in others. It has been remarked that horses which have been fed on hay or grass grown on land that had been manured with an excess of nitrate of soda, are specially liable to it. Robertson has made the same observation with regard to horses fed on large quantities of ripe tares, pease and beans. Maize appears much less "heating" in this respect.

This disease has obtained its name of azoturia from the idea (which has been proved to be erroneous by Friedberger, Fröhner, McFadyean, and Schindelka) that the urine of horses suffering from it habitually contains an abnormal amount of nitrogenous matter. As a rule, the urine of horses affected with it becomes albuminous only in the later stages of this complaint, and then from inflammation of the kidneys. We may look upon this disease as an inflammation of certain muscles of the hind quarters, due to irritation caused by broken-up material in the blood. It has been found that at the beginning of this disease, and even before the manifestation of its symptoms, the number of the red corpuscles of the blood is much above normal (sometimes twice as many), and that it gradually comes down towards the usual standard during the progress of the malady. "In view of this discovery, it would appear that the disease has its starting-point during the period of unwonted rest and liberal diet, which has the effect of raising the number of red cells in the blood. As soon as the horse is taken out to exercise, the destruction of the superabundant corpuscles sets in, and the products of this destruction are accountable for the remarkable train of symptoms. The colouring matter of the destroyed red cells becomes partly dissolved in the plasma, is carried to the kidneys, and there excreted with the urine; while part takes the form of minute granules, which become arrested in the capillaries of certain muscles,

cut off the supply of nutriment to these, and thus cause their death and destruction" (*McFadyean*).

If blood be taken from an affected animal and allowed to stand in any convenient vessel for about twenty-four hours, so as to permit the clot and serum to separate from each other, the serum, which will be on the top, will, on account of the presence of pigment, be of a dark red, instead of the usual straw colour.

From *post-mortem* examinations we find that the affected muscles have suffered from inflammatory degeneration, in that they are pale, swollen, and granular, and have more or less lost their characteristic structure (transverse striation). Schindelka having proved that the blood in this disease contains an abnormally large proportion of pigment, argues that this excess of pigment must be derived from the inflamed muscles, the colouring matter of which is almost identical with that of the blood (hæmoglobin). The fact, however, of there being a marked and continuous decrease in the number of red corpuscles in the blood during the progress of the disease conclusively shows, as pointed out by McFadyean, that the excess of pigment is more or less derived from the broken-up red corpuscles. In severe cases, the urine is charged with pigment; but not in mild ones. The term, hæmoglobinuria, signifies the presence of hæmoglobin in the urine.

Dieckerhoff advances the theory that in this disease there is an abnormal amount of acids (lactic acid, &c.) formed in the affected muscles, which are irritated by this excess. In support of this theory, he advances the fact that the alkalinity of the blood is greatly diminished in hæmoglobinuria, and consequently has tried the effect of large doses of bicarbonate of soda, with which he has been very successful.

SYMPTOMS.—The seizure is sudden, and usually appears when the horse has travelled a short distance after having been in the stable for a few days. The appearance of an animal suffering from this disease is characteristic; for without any visible cause, he becomes excited and seems as if he had severely injured his hind quarters or loins. He has a peculiar, goose-rumped look on account of the muscles over the quarters being violently contracted. One hind limb is generally advanced in front of its fellow, and, on attempting to put weight on it, the hind quarters occasionally drop until the hocks almost touch the ground. Sometimes a fore limb is affected. The breathing is hurried. The animal is bathed in perspiration, and is in such agony that he will seize almost anything with his teeth, and, not unfrequently, will tear the affected side or a fore-arm. Although the pulse is hard and frequent; the internal temperature, even in severe cases, seldom rises to any marked extent. The urine is dark-coloured and is usually copious, though the horse may be unable to void it. Owing to the cessation of the worm-like movement of the bowels, there is, generally, constipation and retention of urine. Sometimes, the symptoms are milder than those here described. On other occasions, the animal soon falls to the ground, and continues to struggle in a delirious, half-paralysed state, until it dies in a few hours.

This disease may be mistaken for cerebro-spinal fever, but differs

from it (1) by the nature of the urine; (2) and by the history of the case.

TREATMENT.—Place the horse in a large, well-ventilated box and give him plenty of water to drink. If he can stand in slings, put him in them. As he is very restless in this disease; he will, if allowed to lie down, knock himself about, and by doing so, will greatly increase the pain and excitement. Besides, the fact of his lying down, is very apt to induce fatal congestion of the lungs. In some cases, however, he will be quite unable to support himself with his hind legs, and, consequently, would fall back in the slings, if they were employed. Theory and the results of experience indicate that bleeding, say, to the extent of three or four quarts of blood, will be advisable. To encourage the elimination of broken-up matters from the blood, we should back-rake the animal (p. 638), give an enema (p. 632), and inject eserine (p. 609), which can be repeated, as may be required. Eserine has the immense advantage, in this disease, of acting with remarkable quickness. If eserine is not available, we may give a ball of aloes, or a pound of Epsom salts in a couple of quarts of water, and as much water as the horse will drink. Foment the loins and hind quarters with warm water, or apply a large hot bran poultice over the loins. Clothe the animal so as to encourage his skin to act.

The urine should be drawn off by means of a catheter from time to time, unless the horse urinates freely. Or we may empty the bladder by applying pressure on it with the flat of the hand, after having passed the hand into the rectum.

On the next and following days, give ounce doses of sweet spirits of nitre, mixed in cold water, three times a day. If there be subsequent constipation, give a pint and a half of linseed oil.

"Kas has treated 16 cases of hæmoglobinuria in the horse with the drug recommended by Metzger of Furtwangen. This drug is potassium bromide. In 15 cases complete recovery took place, most on the 2nd or 3rd day, and the longest on the 5th day. The 16th case had a relapse and ended fatally. Kas gave $2\frac{1}{4}$ to $2\frac{1}{2}$ ounces of potassium bromide in about half to three-quarters of a pint of water, which dose in very severe cases was repeated on the second day." ("Veterinary Record.")

Rackow advises the intra-tracheal injection (p. 635) of 5 grains of iodine and 25 grains of iodide of potassium in an ounce of water daily for three or four days. He states that all his cases which were treated in this way, made perfect recoveries.

Dieckerhoff, after giving a purgative, administers from one to two pounds of bicarbonate of soda on the first day, according to

the size of the horse, and smaller doses on the second and third day.

The food, at first, should be light and laxative; but as there is great subsequent debility, the strength should, after the acute symptoms have passed off, be kept up by liberal feeding. The affected muscles should be brought into work as soon as possible, so that they may quickly get rid of the cause of the irritation. A drachm of sulphate of iron may be then mixed through the food daily, and a couple of quarts of beer also given.

Rheumatism.

The term, rheumatism, is applied to local inflammatory attacks which show a tendency to shift their position from one part to another. Acute rheumatism, which is a high fever accompanied by intense pain from the slightest movement, and which is well marked in man, is, I think, never seen in the horse. We also recognise in man a form of rheumatism which affects the muscles, tendons, ligaments, and joints; but in which symptoms of fever are either wanting, or only slightly developed. It runs a more or less chronic course, and is usually located in or near joints, and, as a rule, manifests its presence by the feeling of pain, only when the affected parts are put into motion, or are subjected to pressure. I have never seen in the horse any affection which bore the faintest resemblance to the rheumatism of man. Other observers, whose accuracy I would not venture to question, state that they have witnessed undoubted cases in the horse, of the second form of rheumatism. Such very rare instances were characterised by shifting lameness, or by inflammatory swellings which appeared suddenly in tendons, ligaments, or joints, and which showed a migratory tendency: for instance, after the attack had kept the back tendons of a fore leg in a swollen and painful condition for a few days, it would manifest itself by an inflamed state of one of the hocks.

Acute rheumatism in man appears to be an infective disease. Sir Thomas Barlow ("The Lancet," 2nd August, 1902) tells us that "the recent researches of Dr. F. J. Poynton and Dr. A. Paine seem to have established the existence of a specific diplococcus in the blood, in the valves of the heart, in the pericardial exudation, in the joints, and in the subcutaneous nodules of acute rheumatism. From pure cultures of this organism intravenous inoculations in rabbits have been followed by clinical manifestations and by non-suppurative lesions similar to those with which we are familiar in acute rheumatism." In the chronic rheumatism of man, gout appears to play an important part. Gout is caused by the deposition of sodium biurate in various tissues, in which its presence gives rise to irritation, interference with movement, and alteration of structure, especially in joints, where its existence is made more or less manifest by the formation of "chalk stones." In these cases, uric acid, on entering the blood, combines with the sodium of that fluid. The resulting sodium biurate has a strong tendency to

become precipitated. Hence its removal is the best treatment. Dr. Arthur P. Luff in his "Pathology and Treatment of Gout," has shown that the mineral matter of green vegetables increases the solubility of sodium biurate and thus aids its elimination from the system; and that the mineral matter of grain and meat has not this beneficial property (p. 189). The correctness of this statement has been amply proved in practice.

Hence, if a horse has a gouty tendency, which might be manifested by rheumatic symptoms, we should feed him, as far as practicable, on grass, either in its green state, or in its dried form (hay); and should avoid corn. It would also be well to quicken the circulation by judicious exercise, warm clothing, pure air, hand rubbing, and by stimulating the part with an embrocation, such as compound camphor liniment, or a saturated solution of camphor in paraffin oil. Radiant heat baths are an admirable treatment for chronic rheumatism in man.

A verdict of rheumatism is not unfrequently used as a convenient "get out" by persons who, in certain cases, are unable to determine the cause of the lameness or pain, and do not wish to confess their ignorance.

Rabies

is an infective disease which is transmitted from one animal to another by inoculation.

NATURE OF THE DISEASE.—The only special connection between rabies and the dog tribe is that those dogs, wolves, foxes, and jackals which are affected with it, are, by reason of their biting powers, particularly good disseminators of the virus.

Although the contagion of rabies has not yet been isolated, we have strong reason to believe that the disease is due to bacteria (p. 448), which, on gaining entrance into the system, give rise to a poison that produces the characteristic symptoms. The theory of its microbic origin is strengthened by the fact that the course of the attack is uninfluenced by the amount of the virus received into the body, and that, if the virulent matter be carefully filtered, it will fail to set up rabies by inoculation; although it will give rise temporarily to the symptoms of that malady (Blasi and Travali). The virus accumulates chiefly in the brain and in the spinal cord. If the former be its principal seat, furious rabies will, according to Pasteur, be produced; if the latter, "dumb madness" (paralytic rabies) will be the result. The contagion is also to be found in the saliva, tears, milk, and other secretions; but not in the blood. It cannot be carried by the air from one animal to another, and, practically speaking, is communicated only by inoculation. Experiments made by Nocard and others, with the object of giving the disease

by feeding dogs on virulent rabic matter, such as the brain and spinal cord of dogs which had died from rabies, have always failed. A pregnant animal which becomes affected with rabies, can communicate the disease to its fœtus. Nocard and Roux have shown that the saliva of a dog which has been inoculated with rabies, becomes capable of giving the disease, as long as three days before the characteristic symptoms make their appearance. Pasteur has shown that the infectious matter remains virulent for at least a fortnight, even in the dead body after putrefaction has set in. Rabies cannot be produced spontaneously, and, being propagated by inoculation (almost always by a bite), its appearance is independent of the season of the year. To produce the disease, the virus must come in contact with a wound either in the skin or in the mucous membrane.

VARIETIES OF RABIES.—Rabies, as indicated in the preceding paragraph, may assume a furious, or a paralytic form. In the latter, the muscles of the jaws, limbs, or hind quarters become paralysed. Symptoms of paralysis usually appear in the last stages of furious rabies. The paralytic form is not uncommon in the horse.

PERIOD OF INCUBATION is generally from one to two months. In man it seldom exceeds six weeks.

CHANCES OF RECOVERY, after the symptoms have shown themselves, are practically nil.

DURATION OF THE ATTACK, from the first commencement of the symptoms, is about five days.

SYMPTOMS.—The first symptom is extreme watchfulness and liability to be startled at the slightest noise or at the sight of any moving object. The temperature is high and the pulse frequent and strong. The horse becomes seized with paroxysms of excitement, which increase in severity, while the intervals of rest get shorter as the attack continues. There is sometimes more or less paralysis of the hind quarters, and continued spasm (which becomes worse during the paroxysms) of the neck and throat, which renders the animal unable to drink water, although he may try to do so. This inability to drink is by no means a constant symptom; for some rabid horses will drink freely almost up to the last. In some cases, there is a copious discharge of saliva from the mouth and a hoarse cough. It has been frequently noticed that the horse will bite and tear at the spot which was bitten, if it be within reach. The animal becomes more and more excited, until he gets into a state of mad fury, falls down, becomes convulsed or insensible, and dies. The urine of a rabid horse almost always contains sugar.

The symptom of all others to note in a suspected case, is the watchful, horrified, or "hunted" look with which a horse in the first stage of rabies will regard any one who goes near him. The moment this is observed, he should be secured, so that he cannot injure himself or anyone else, while we are waiting for the confirmation of our suspicion of rabies.

PREVENTIVE MEASURES.—If we can take the animal in hand shortly after the bite has been inflicted, we should freely cut away the part, or destroy it with a red-hot iron, nitric acid, or lunar caustic. If a bacteriological laboratory be within reach, protective inoculation might be tried.

AS TREATMENT is of no avail after the symptoms have manifested themselves; the only thing to do is to destroy the affected horse.

Tetanus (*Lockjaw*)

is a state of continued contraction of the voluntary muscles,* caused by the presence, in the animal system, of poisonous material produced by a ferment which is formed by a specific disease germ (the *bacillus spilliformis* of Nicolaier).

NATURE OF THE DISEASE.—The microbes of tetanus are widely distributed over the face of the earth, and grow well in horse dung and on marshy ground. Owing to the fact that they are frequently swallowed along with forage, they can often be found in recently expelled dung. The most favourable temperature for their development is about 70° F. They act by means of extremely virulent poisons, which they manufacture, and which cause the terrible and characteristic symptoms of the disease. In fact, a case of tetanus is as much a case of poisoning as one caused by an overdose of strychnine. The poisonous material of tetanus consists of at least four different kinds of poisons (tetanin, tetanotoxin, spasmotoxin, and hydrotetanin), which become fixed in the brain and act on it. The violence of the symptoms, other conditions being equal, appears to be proportionate to the amount of poison received by the patient.

Carougeau (Cadéac's "Encyclopédie Vètérinaire") tells us that in a state of nature, the microbes of tetanus exist in the form of spores which do not manufacture any poison. But if they are introduced into the animal tissues under certain favourable conditions, they go through a form of development and subsequently secrete their toxins, with the result of setting up this disease. If these spores are inoculated by themselves into healthy tissue, they are unable to produce their poisons for the time being, and will in all probability be destroyed by the leucocytes (p. 15). Some of them may, however, remain alive though inactive for even three months or more, and, under conditions favourable to their development, they may subsequently

*NOTE.—Muscles are divided into voluntary muscles, and involuntary muscles. The former, like those of the limbs and face, are under the power of the will. The latter, like those of the intestines, heart, and arteries, can perform their duties independently of such control.

become virulent and produce tetanus. Hence, the fact that, occasionally, the period of incubation is unusually long. The conditions in question appear to be those which diminish the resistance of the tissues, by repelling the protective leucocytes; one of the chief of these conditions being the presence of certain common microbes which produce pus and which favour the development of the micro-organisms of tetanus, Suppurating wounds are therefore particularly good breeding grounds for the bacilli of this disease. Injury and the presence of foreign bodies also act favourably in the same direction. Hence, we find that wounds which become polluted with soil and dirt are specially liable to be followed by symptoms of this disease; and the lesson is obvious that the cleaner we keep wounds, the less danger will there be of tetanus.

It appears that the skin and mucous membrane, when unbroken and in a healthy state, will bar the entrance, into the system, of the tetanus poison, which, however, is capable of getting through the smallest breach existing in these coverings. Before the nature of the disease was known, cases in which a wound was evidently the point of infection were classed as those of "traumatic tetanus;" and cases in which no wound was discernible, as those of "idiopathic tetanus." Such a distinction is, with our present state of knowledge, not alone unnecessary, but is misleading. As these bacilli cannot develop in air (or rather in oxygen), punctured wounds are more favourable to the production of tetanus than superficial ones. Also, as there is a fair amount of oxygen in the blood, these microbes cannot live in it, unless when it has lost a large proportion of its oxygen, and consequently they remain, as a rule, in more or less close proximity to their original point of entrance. The fact that the microbes of this disease very rarely indeed obtain entrance from accidentally-inflicted clean-cut wounds, is probably owing to the comparative freedom from contamination enjoyed by these injuries. No such immunity is possessed by clean-cut wounds made by surgical instruments which have been employed in tetanus cases, and which have not been thoroughly disinfected. These germs are frequently found in some districts, and rarely in others. They appear to be much more common in the tropics than in temperate climates. Nicolaier proved that the subcutaneous inoculation of earth often gave rise to tetanus. In such cases it is almost needless to say that the inoculated earth contained the spores of this disease and other micro-organisms which are favourable to their development. We should, therefore, be particularly careful to clean and thoroughly disinfect all wounds—such as broken knees, overreaches, and especialy punctured sole and frog—which are liable to contamination from the soil.

Bonome and other observers have proved that the microbes of tetanus, when in the form of spores, can preserve their vitality even in boiling water. The poison of tetanus can be destroyed by strong acids, like carbolic acid or hydrochloric acid, by boiling water, or by keeping it for five minutes at a temperature of 130° F. Hence, it does not appear dangerous to allow animals (hounds, for instance) to consume the cooked flesh of horses which have died of tetanus. Dogs are much less susceptible to it than are horses. Hewlett states that direct sunlight destroys it in from fifteen to eighteen hours' exposure; and that it maintains its virulence almost indefinitely in a cool dark place. These considerations and the fact that tetanus germs cannot develop in air, teach us the advisability, in the prevention of this and other diseases, of exposing, as much as practicable, the bedding of our horses, and the interior of our stables, to the purifying action of sunlight and fresh air.

Tetanus, as we have seen, can occur only by inoculation. For all practical purposes, we may accept as a fact that one horse cannot give it to another; although it might very easily be conveyed by an intermediate carrier, such as the hands or instruments of a person who had been attending a case of tetanus. It is probable that when the disease follows a surgical operation, the poison has been derived, as a rule, from infected instruments. The wounds which are most generally followed by lockjaw, are those of castration, docking, broken knees, deep wounds in a limb, and especially punctures in a foot.

Wounds in the intestines (for instance, by worms) are probably the usual points of entrance of these microbes, when the disease is conveyed by means of food or water.

PERIOD OF INCUBATION.—"The period between the introduction of the germs of tetanus and the appearance of the first symptoms is very variable. Its average duration is fifteen days. Hoffman saw tetanus set in six hours after a prick in the foot of a horse. Usually it develops between the second and thirtieth day" (*Carougeau*). Professor McFadyean ("Journal of Comp. Path.," Sept., 1897) states: "In natural tetanus occurring in a wound infection, the period of incubation is seldom less than a week."

MORTALITY.—According to Carougeau, the percentage of mortality varies from 70 to 75.

THE CHANCES OF RECOVERY vary according to the length of the period of incubation. If that period is short, death is almost certain. Also, the more acute the attack, the less hope will there be of recovery. Tetanus is much more fatal in young animals, and especially in foals, than in old horses. We may hope for the best, if after nine or ten days, the patient is doing fairly well.

DURATION OF ATTACK.—Tetanus generally runs its course in from three days to six weeks.

SYMPTOMS.—The muscles that are usually first brought under the influence of the continual spasm of tetanus are those of expression, which, when thus affected, give the face a pinched or drawn appearance. The other muscles of the head and those of the neck soon follow. Hence, we have the mouth closed, the nose poked out, the head elevated, and the neck "ewed" (from contraction of the levator humeri). The muscles of breathing and those of the limbs become contracted so that the back is hollowed and the tail raised, and the horse stands with out-stretched limbs. He shows great stiffness and rigidity in attempted movement. The eyes are sunk, and, during excitement, as when a person startles the horse, the haws are quickly protruded and then withdrawn. The animal looks nervous and terrified. The nostrils are dilated, the breathing quickened, and the flanks tucked up and heaving, which symptoms are due to the fact of the muscles of the chest becoming fixed, so that breathing has to be carried on almost entirely by the action of the diaphragm. As this abdominal breathing can be maintained for only a short time, we generally find that cases of tetanus which are rapidly fatal, are those in which spasm of the muscles of the

chest is a prominent feature. Death may also quickly occur from continued spasm of the muscles of the larynx. The symptoms generally come on gradually. Although there is continued cramp of the muscles; the patient suffers from aggravated spasms from time to time, the slightest noise or excitement being frequently sufficient to bring them on. The bowels are constipated, and there is often retention of urine, from the horse being unable to stretch himself out. In very mild cases the animal may be able to lie down. As a rule, the patient preserves his desire for food and drink; but is unable to gratify it, except to a very small extent, owing to the rigidity of his chewing and swallowing muscles.

"Recovery is rare before the third week. Generally about this time, the muscular contraction begins to decrease; the appetite improves; the breathing becomes calmer; and the movements easier. Very often the change for the better does not set in before the end of the fifth or sixth week; and the improvement continues through a long period of uneasiness, rigidity of movement, and stiffness of the spinal column [from the head to the tail]. Convalescence is long, and is often protracted for several months" (*Friedberger and Fröhner*).

IMMUNITY AND PROTECTIVE INOCULATION.—Horses may be made immune from tetanus for a short time by one attack of this disease, or by injecting, at first, extremely small doses of the tetanus poison, and gradually increasing it to a very large amount, which can be done, later on, without the animal becoming affected. This process of protective inoculation could be carried out only under the direction of a capable bacteriologist.

The immunity conferred by an attack of tetanus, appears to be of short duration. Mr. Sidney Villar, F.R.C.V.S. tells us ("Journal of Comp. Path." Dec. 1897) that he "treated a black filly which recovered from an attack in September, but again fell a victim to the disease in the following July."

We have seen in Chapter III. that protection can be obtained by injecting immune serum at the time of, or shortly after, infection. The action of the serum is limited to destroying (or neutralising) the toxins which are in the blood and those which are being manufactured by the bacilli that are located in or near the wound; but the serum has no neutralising effect on the toxins which have become fixed in the brain (Carougeau). Hence, the longer its application is delayed, the less efficacious will it be. In places where tetanus is common, it is evidently wise to use protective inoculation against this disease in cases of wounds which, like those of castration, punctured feet, &c., are, under ordinary circumstances, frequently followed by tetanus, and which cannot be treated antiseptically. There should, as we have seen, be no delay in applying this means of protection. Nocard recommends an injection of about $\frac{7}{10}$ oz. (20 cubic centimetres) of immune serum under the loose skin of the neck or shoulder, and repeated after an interval of a fortnight. The period of immunity obtained from the injection of anti-toxin serum, is more or less proportionate to the dose, and lasts from a fortnight to six weeks. It can, however, be prolonged indefinitely by successive injections.

PREVENTIVE TREATMENT.—The remarks already made about the microbe of tetanus will show the necessity of treating wounds, as far as we can, antiseptically (p. 67), especially in places where this disease is common. Although the spores of tetanus are but little

susceptible to the action of antiseptics, they cannot become virulent under ordinary circumstances, unless they are accompanied by certain bacteria, which can be easily destroyed or rendered inert by an antiseptic. Here, the indirect action of the antiseptic employed is of paramount importance.

We should remember that any person who has been attending a case of tetanus, will be liable to infect the wound of an otherwise healthy horse, if he touches it, unless he has taken the precaution to render his hands and instruments perfectly clean (p. 70) There is ample evidence to prove that tetanus has been frequently transmitted to animals with fatal effect by ignorant or careless men in this manner.

TREATMENT.—The treatment of tetanus, after the symptoms have become manifest, has been up to the present, eminently unsuccessful in lessening the mortality from this terrible disease. If the patient has received a comparatively small dose of the poison, he will recover in all probability; if a large one, he will die, despite every effort of the veterinary surgeon. The injection of immune serum is usually made into the jugular vein (p. 636) every two or three days in doses of 20 cubic centimetres (about $\frac{7}{10}$ oz.). The injection of serum into the brain is a complicated operation which is well described by Carougeau.

Naturally, the first thing to do is to try to destroy any of the exciting poison or germs which we can reach. Hence, if we can find the wound through which the attack has been made, we should open it out, and destroy its surface by means of the knife, the firing iron, or caustics. Its thorough disinfection by means of undiluted carbolic acid; a solution of 40 grains of chloride of zinc to the ounce of water; or lunar cáustic will be advisable. As the spasms of tetanus cause intense pain and exhaustion, we should do everything we can to soothe the animal and to keep up his strength. Owing to the long continuance of the disease, medicines are of little use; quietude being the chief consideration. If possible the patient should at once be put into slings, not alone to afford him rest, but also to prevent him from getting down, in which event the excitement brought on by struggling to get up again will probably lead to a fatal termination of the disease. The horse should have a plentiful supply of nutritious gruel, milk, and hard-boiled eggs mashed up either in the gruel or milk, which he can suck up even when he cannot chew his food. The best soothing medicine to give is chloral hydrate (p. 604) 2 oz. of which may be given during the day in a liquid mash. Cargoureau advises $3\frac{1}{2}$ oz. of it daily in enemas (p. 632).

Blood-Poisoning (*Septicæmia and Pyæmia*).

By the popular term "blood-poisoning" is meant a state of constitutional disturbance brought on by the introduction, usually from a wound, of putrid products into the blood.

There are three kinds of blood-poisoning: (1) Septic poisoning, in which the absorbed deleterious matter is a chemical poison that, other things being equal, affects the system in proportion to its amount. (2) Septic infection in which the poison is formed by a ferment manufactured by bacteria that can increase and multiply in the blood. Cases of blood-poisoning from wounds inflicted during post-mortem examinations come under this heading. (3) Pyæmia. Here, the absorbed material consists of pus-forming bacteria (and, probably, poisonous matter formed by their ferments) which, having gained entrance into the blood-stream, distribute themselves throughout the system, and, in some cases, on becoming finally arrested in the small blood-vessels, set up abscesses in various parts of the body. Although pyæmia generally occurs from the absorption of ordinary pus germs (of which there are several kinds) existing in a wound or abscess; a similar process may take place when pus is formed by specific disease germs, as in strangles, in which case we might regard the abscesses as the result of a specific pyæmia.

Septic poisoning and septic infection are classed under the general heading of "septicæmia," which signifies a putrid condition of the blood; and pyæmia, a state in which pus exists in the blood.

It appears that generally some pressure or inoculation is required for the introduction of the poison into the blood. Hence the necessity of free drainage from a wound, and its thorough disinfection. The only hopeful cases are those of septic poisoning, in which by drainage and disinfection we may hope to cut short the supply of poison. We may give an ounce of sulphate of quinine daily to act as an antiseptic on the blood. In all three forms there is high fever, and great depression and debility. In pyæmia the wound becomes dry and unhealthy-looking; and the resulting abscesses, which begin to appear about a week after infection, have the peculiarity of forming very rapidly. Pyæmia may run a somewhat chronic course, with, as a rule, a fatal termination from exhaustion and diseased changes.

Navel-String Infection

(*Umbilical Pyæmia*, *Navel ill*, *Joint ill*, *Scrofulous ostitis*, *Pervious urachus*, *or Joint felon*).

DEFINITION.—This disease is a form of blood-poisoning, which, among horses, is peculiar to foals, and is characterised by fever, painful swelling of certain joints, and almost always by an open and suppurating condition of the navel.

NATURE AND CAUSE.—While the unborn foal (*fœtus*) is in the womb of its mother, it is surrounded by enveloping membranes

which constitute the after-birth on delivery. These membranes are attached to the wall of the womb, and are connected to the fœtus by means of the navel-string (umbilical-cord), which is provided with two arteries and a vein for the nourishment of the young creature and for the removal of its waste products. It also has a narrow canal (the *urachus*) which serves to remove the urine of the fœtus; in fact, the subsequently formed bladder takes its origin from a dilation of the urachus. Under normal conditions, when the foal is born, respiration takes place, the umbilical arteries and vein become quickly blocked up, urine is discharged through the urethra (which communicates with the penis or vagina, as the case may be), the foal enjoys a separate existence, and the wound, caused by the division of the umbilical cord, leaves a scar which is known as the navel.

It is usually supposed that the microbes of navel ill gain admittance into the body through the exposed surface, before the wound has closed. We read, however, in the "Veterinary Record" of 14th Dec., 1901, that Schule, who is Head Veterinary Surgeon at the Wurtemburg State Stud in Marbach, has shown that "the mother is the bearer of the infection, for in the uterine secretions of the stud mares whose foals fell with navel-ill, the same characteristic bacteria were found as were present in the joints of the affected foals. The infectious material is by the act of covering conveyed from mare to mare, so that the mucous membrane of the womb becomes the habitat of the specific bacteria.

"By inoculation of these bacteria into the blood stream of foals an illness was produced, which in the smallest particular could not be distinguished from that arising in naturally affected foals." If the infected microbes are transmitted by the dam, it is a strange fact that their presence does not produce any disturbance in her.

INFLUENCE OF LOCALITY.—Although, as a rule, this is a rare disease, it is very common in some places. Mr. Wharam, M.R.C.V.S., tells us ("Veterinary Record," 11th May, 1901) that "I have known several instances on particular farms, where they were unable to raise either foals or calves, but if removed to another farm, immediately after or before foaling, the foal lived, and was reared without difficulty, and although constitutional debility plays an important part, the presence of specific organisms constituting an infected area is, I believe, the most important factor in producing this disease."

MORTALITY.—According to Hering and Bollinger, about 75 per cent. of the cases die within the first three weeks after birth. This high rate of mortality would be considerably diminished, if proper treatment was adopted.

SYMPTOMS.—The attack usually comes on during the second or third week after birth, and almost always before the closure of the navel opening, which, in affected animals, will be found to be in a wet and suppurating condition. Occasionally, foals two or three months old, which have the urachus closed, and are in an apparently healthy condition, contract this disease, in the form of painful swelling of the joints.

The first symptoms are generally dulness; more or less fever; lameness, which is often attributed to rheumatism or to injury caused by the mare treading on the foal; and disinclination to move or even to stand. On examination, the patient will be found to have a soft, gelatinous swelling of one or more of the joints, of which the hock, stifle, elbow, fetlock and hip usually manifest the enlargement most clearly. These swellings are hot and painful to the touch, they tend to suppurate, and frequently cause intense lameness. In very rare cases, open urachus may occur without any joint inflammation. In this disease, inflammation of the joints and open urachus are almost always co-existent.

Animals which recover from a bad attack, are seldom worth the trouble of rearing, because, as a rule, their constitutions become permanently impaired, and one or more of their joints become stiffened by the attack.

COURSE AND POST-MORTEM APPEARANCES.—The course of this disease is that of septicæmia and pyæmia (p. 532), in which the local inflammation in the various tissues and organs is productive of abscesses, and consequent destructive action in the surrounding parts, as, for instance, in joints, tendons, muscles, and in the liver. In fatal cases, there is rapid loss of strength and condition, and the disease runs its course in about ten days.

TREATMENT.—In the treatment of this disease, we have to attend to the constitutional disturbance, inflamed joints, open urachus, and complications, such as constipation and diarrhœa.

As constitutional treatment, we may give $\frac{1}{2}$ drachm of quinine (p. 623), twice a day; and also, 2 drachms of Fellow's syrup and a tablespoonful of cod liver oil in half a pint of milk, morning and evening. A German veterinary surgeon, Herr Gott, strongly recommends the injection, into the jugular vein (p. 636), of 3 oz. of a $\frac{1}{2}$ per cent. solution of argentum colloidale, Credé, every day for three or four days. The quantity of this soluble form of silver thus given, is about $6\frac{1}{2}$ grains.

As a supplement to the food, we may give brown sugar or treacle, both of which are easily digested, and are very nourishing. Four or five eggs daily will also aid in keeping up the strength.

Mr. Wm. Toppin Hewetson, M.R.C.V.S. ("Veterinary Record,"

23rd Nov., 1901), tells his readers that "the comfort of our little patient must be studied under all circumstances. If the weather be at all cold, our patient should be covered by a warm sheet. Should the foal have any difficulty in rising from the recumbent position, an attendant should be told off to assist it to rise, and see that it is regularly fed. It is only in extreme cases that the animal refuses to suck its dam. During the fine weather, and especially if the ground is dry, such a patient is always the better of a little sunshine, but on no account must it be left out during extreme heat, as in this state it is very liable to sunstroke. The best food for the mare is grass, which during the day she can generally have."

The inflamed joint or joints should be rubbed with an ointment of biniodide of mercury (1 to 8 of lard or vaseline), which, when applied to the skin, appears to have a well-marked antiseptic action on the underlying tissues. An inflamed joint should on no account be bathed with warm water, fomented, or poulticed; because the application of moist heat would be the best possible means for promoting the development of the infective microbes, which are the cause of the local and general disturbance.

Mr. George Wartnaby, M.R.C.V.S., was, I believe, the first to use formic aldehyde (p. 610) in this disease, and has been very successful in its application. He tells me that he uses 40 minims ($\frac{2}{3}$ drachm) of an 8 per cent. solution injected subcutaneously (p. 633) over the affected joint every other day for a fortnight or so; and that he gives internally $\frac{1}{2}$ drachm of a 4 per cent. solution in 2 oz. of water, three times a day.

The open navel-string should not be ligatured, because that operation is generally followed by increased inflammation of the part, and by aggravation of the other symptoms, apparently on account of this outlet for deleterious products becoming blocked up. If the navel-string has been ligatured, and is in an inflamed state, the ligature should be removed without delay.

Mr. Hewetson has had very good results in getting the open urachus to close in a healthy manner by applying to it, a 1 to 4 solution of formaline (p. 610) in water, and injecting a little of the solution into the opening. Or we might treat the wound with a watery solution of chinosol (1 grain to 1 oz.), or creolin (1 drachm to $2\frac{1}{2}$ oz.), inject a little into the open navel two or three times a day, and apply tannaform or iodoform.

Veterinary Surgeon Desmond sends me the following account of his method of treating inflamed joints in this disease: "Cast the foal, which is done by two men, one on each side, seizing it round the neck with one hand each, and under the flank with the other hand. On no account should a rope be used to cast foals. When the animal is secured, clip the hair with a pair

of curved scissors over the enlarged joints, wash well with methylated spirits of wine, and then paint in a liberal manner with liniment of iodine. When one layer of the iodine is dry, coat after coat is to be painted till the part is quite black. If there is fluid in the joint, I proceed to remove it in the following manner, after I have, as already described, applied iodine very liberally. Wash a hypodermic syringe and the needle with a hot solution of washing soda, then with methylated spirit, and draw off all the fluid possible from the joint. If these precautions are taken, there will be no fear of further infection with the hypodermic needle. I have not had a single failure with this method, and have not had to apply more than one dressing."

The urine that dribbles out of the open navel, acts as an irritant to the parts (legs and abdomen) on which it falls. A good preventive is the application of vaseline or salt-free grease on the surfaces which are likely to be invaded.

Constipation is a frequent complication of this disease, and as a rule, can best be treated through the milk of the dam, to whom, with this object, a plentiful supply of carrots or parsnips with her freshly-cut grass should be given. Enemas (p. 632) of water at a temperature about equal to that of the blood, will also be very useful. If these simple and safe measures fail, give 4 to 6 oz. of linseed oil, according to the age of the patient.

If diarrhœa appears as a complication, it can be treated in the manner described on p. 430.

PREVENTIVE MEASURES.—Preventive measures, if properly carried out, will be entirely successful. The surroundings of the mare before foaling should be healthy, and, if necessary, the box or stall should be disinfected, and clean straw put down in it. After the foal is dropped, and as soon as the beating in the artery of the cord can be no longer felt, we should tie the cord about an inch below the skin, with an antiseptic ligature (a piece of tape which has been steeped in carbolic acid or creolin will do), cut the cord below the ligature with a clean knife or pair of scissors, apply the carbolic acid or creolin on the cut surface and over the stump up to the skin, and cover the wound with tannoform or some other suitable antiseptic (p. 67). This should be repeated daily for about a week or until the cord just above the string can be safely cut off close to the stump. The wound may now be treated with any suitable antiseptic such as a saturated solution of iodoform in turpentine, or Friar's balsam. The opening in the navel should be kept thoroughly clean, and may be plugged up with a piece of cotton wool which has been soaked in the antiseptic. These precautions are, of course, specially applicable in studs in which this disease has already appeared.

CHAPTER XXIII.

Diseases of the Liver.

CONGESTION AND ACUTE INFLAMMATION OF THE LIVER—CHRONIC INFLAMMATION OF THE LIVER.

Congestion and Acute Inflammation of the Liver.

As it is very difficult to distinguish the various diseases of the liver of the horse, one from another, in the living animal; I cannot see, with our present state of knowledge, the use of following human physicians in their minute divisions of these affections. Congestion is the first stage of inflammation of the liver. *Jaundice* is a symptom of derangement of that gland, and is not a disease in itself.

Many of the grave diseases of the liver to which men are subject, are practically unknown among horses.

CAUSES.—The usual causes are too high feeding, want of exercise, defective ventilation, residence in a damp, hot climate, and chill. In India, these affections are very common. Horses in that country are liable to general derangement of the liver during the hot weather; and acute attacks are frequent just after the rainy season, in localities where there is a considerable fall in the temperature of the air at night, as in places close to the hills. This tendency is increased by the practice pursued by many of the native grooms, who are, generally, but ill provided with garments, of removing the horse's clothing to use as their own bedding. It is easy then to conceive how the horse gets derangement of the liver; for the cold, acting on the surface of the body, contracts the superficial blood-vessels, and, thereby, drives the blood to the internal organs. It stands to reason that the organ which is in the worst state of health will be the first to suffer from a sudden rush of blood. Hence we find that in cases of chill, the liver of the horse is particularly liable to disease in India; and that the

lungs, pleuræ, and bronchial tubes are more prone to attack in the colder climate of Great Britain.

I have found that acute attacks of liver disease in India, are comparatively frequent in places where there is a marked fall, at certain seasons of the year, in the temperature of the air at night; and that chronic disease of that organ is peculiarly rife in hot, damp climates like that of Bengal. Horses thrive well, under proper management, in hot climates so long as the atmosphere is dry; but the presence of an excess of moisture in it is prejudicial to the well-being of these animals. In fact, in many hot, damp climates, it is practically impossible to breed and rear horses capable of doing ordinary work.

Australian and English imported horses, in India, are much more liable to these affections than are Arabs and indigenous animals.

The practice, in India, of bathing in cold, instead of in hot water, is a fruitful source of liver disease among men; and acts in the same baneful manner as that of depriving horses of their clothing during cold nights which follow hot days.

SYMPTOMS.—Yellowness of the gums and of the lining membrane of the eyelids; loss of condition; clay colour and offensive smell of the dung, which is sometimes mixed with coffee-coloured patches; sour smell from the mouth; loss of appetite; constipation; and urine high coloured on account of the colouring matter of the bile being excreted along with it. There is dulness and depression, accompanied at first by some fever, which may be perceived from the increased frequency of the pulse and rise in the internal temperature of the body. The horse may evince, on pressure over the region of his liver (the right side), the presence of pain. In some few cases, there is lameness of the off fore leg.

NATURE OF THE DISEASE.—The liver is a large gland, which weighs, in the average adult horse, about 11 lbs. Besides the arteries that go to it for its own nutrition, as well as their corresponding veins, the liver receives a large supply of blood from the portal vein, into which is poured the greater part of the blood that is received from the internal organs of digestion on its way back to the heart. The liver, therefore, has two systems of circulation; namely, one nutritive; the other functional. Speaking in general terms, the chief functions of the liver are: (1) To form glycogen from the saccharine and nitrogenous matters which are absorbed into the blood from the food. Glycogen is stored in the cells of the liver, from which it is removed in the form of grape sugar into the general circulation; partly for supplying the system with force (for movement and the maintenance of the internal heat), in being converted into carbonic acid and water by its union with the inspired oxygen, which combines with its carbon; partly for the nourishment of the tissues; and probably, for the formation of fat. (2) To break up worn-out red blood corpuscles, which yield bile pigment and urea, and which, as Kühne has shown, are dissolved by the bile acids. (3) To convert albuminous matters (both waste and nutritive) in the blood, and also glycogen, into products that can easily be eliminated from the

system; the waste material being finally excreted from the kidneys, in the form, chiefly, of urea. The undue retention of these matters in the blood, whether by the failure in action of the liver, or of the kidneys, gives rise to great depression, and in extreme cases, to insensibility and death. (4) To excrete carbonic acid. (5) To form bile. As the vessels which supply the portal vein absorb nutritive matters from the food, it follows that, when an animal is too highly fed, its liver will be unduly taxed, with the result of more or less serious derangement. As the liver requires a large amount of oxygen for the purification of, and changes wrought in, the blood; the want of air and exercise is specially injurious to that organ. The rate of breathing directly affects the rapidity of the circulation of blood through the liver; hence, a state of idleness will tend to induce congestion of that gland. The effect of a hot atmosphere not only diminishes the amount of air taken into the lungs—for the warmer the air, the more rarefied will it be—but, also, brings on destructive changes in the structure of the liver. The skin, which is peculiarly active in the horse, helps the liver in removing impurities from the blood; hence, when the functions of the skin are checked by the presence of a large proportion of moisture in the air, the powers of the liver will be unduly strained. This fact appears to be one of the chief reasons that hot, damp climates are peculiarly unsuitable to horses. As exercise quickens the entire circulation, its absence will, naturally, render that of the liver torpid.

The liver is composed of a large number of lobules, which are about the size of millet-seeds, and in which bile is manufactured. This yellow fluid is carried from the lobules by bile-tubes, which unite, and finally form a common duct, which discharges the bile and also the pancreatic juice into the small intestine, in order that they may mingle with the semi-prepared food (chyme) that has just quitted the stomach. The bile-tubes are lined with mucous membrane, which, in a state of health, constantly secretes mucus, to lubricate these passages. Surrounding this membrane, there is a coat of involuntary muscular fibre which urges forwards the bile and mucus by its contractions.

Bile acts as a natural purgative. Hence, when it is absent, the bowels become constipated, and the dung emits an offensive odour and assumes a clay colour on account of not being tinged by the colouring matter of the bile. When the bile is regularly discharged, there are often coffee-coloured patches found on the dung; a fact which is owing to an altered condition of that secretion. Bile assists the pancreatic juice in forming an emulsion with the fat contained in the chyme. These two fluids being alkaline, a soap is formed, in which the oily particles are split up into a very fine state of division, so that the chyme (now called chyle) assumes a white appearance. The object of the minute division of fat is to facilitate its absorption. The fact of the mucous membrane of the intestines being moistened with bile quickens the absorption, through this coat, of fat contained in the food; hence, when the amount of the bile which is discharged into the intestine, is deficient in quantity, the animal will, in all likelihood, lose condition. Bile also aids in the absorption of albuminous matters.

Bile is composed of bile acids and colouring matter, which, as we have seen, is derived from the colouring matter of the red corpuscles of the blood. "The source of the bile acids has not been determined" *(Hamilton).*

When congestion of the liver occurs, its vessels become over-filled with blood, and as, at the outset of every case of inflammation, the function of the attacked organ is stimulated, an increased supply of bile is secreted. The liver now swells considerably; the bile tubes become blocked up, owing to the inflamed state of their mucous lining, and to the presence of the over-distended blood-vessels; and the whole gland becomes gorged with bile, of which little or none, as shown by the clay colour of the dung, is discharged. The bile, thus obstructed, is in part absorbed by the blood, and taken into the general circulation, so that the various tissues acquire the characteristic tinge of jaundice. The bile is finally excreted by the kidneys, and to a small extent by the skin.

Jaundice is a state of the body in which most of the tissues and fluids become stained by the colouring matter of the bile. Hamilton considers that "all cases of true jaundice resolve themselves into jaundice from obstruction," when, as we have just seen, the bile is prevented from getting into the small intestine. Murchison held that jaundice might take place when there is no obstruction, but from some cause, such as an excessive secretion of bile, especially when conjoined with constipation, by which this fluid, having gained access to the intestine, is not changed into new products, as it ought to be, but becomes absorbed into the blood, and consequently stains the skin and other tissues.

The depression and debility experienced in jaundice may, to some extent, be owing to the presence in the blood, of bile acids, which destroy the red corpuscles. It is, however, more probable that they are due to the retention, in the blood, of various impurities, which the liver, when it is in a diseased state, is unable to transform, with sufficient quickness, into products which the kidneys can readily remove; for we find that the injection of bile into the blood gives rise to no special symptoms of depression. The fact of the various tissues being stained with the colouring matter of bile does not, in all cases, imply the existence of debility.

PRINCIPLES OF TREATMENT.—To relieve the congestion of the vessels of the liver, and also to get rid of noxious materials contained in the blood, we may use a purgative, the effect of which will be to draw blood away from that organ to the intestines, and, also to cause the evacuation from the blood of a quantity of its watery fluid, which holds the hurtful materials in solution. The aperient I would recommend is sulphate of magnesia (Epsom salts). Its action should be assisted by keeping the horse on laxative food, such as bran mashes, roots, and green fodder. Two or three enemas of warm water, in order to clear out the rectum, might be administered. As the kidneys and skin (to a less degree) are the organs which remove the bile that has been absorbed into the blood, we may with advantage stimulate them. For this object, I would advise the use of nitre, which acts on the kidneys, or of sweet spirits of nitre, which acts on the kidneys and skin, and is also a stimulant; warm fomentations over the region of the liver (the right side); and warm clothing. To aid in overcoming the great debility, as well as to stimulate the kidneys and skin, the employment of sweet spirits of nitre is, I think, specially indicated. Care should be taken to allow the animal a plentiful supply of fresh water, in order to keep the blood in a sufficiently fluid condition. Moderate exercise and a full supply of fresh air are essential.

While we have thus endeavoured to reduce the congestion of the liver, to remove bile which has been absorbed into the blood, and to overcome the constipation of the bowels, we have in *ipecacuanha* a valuable agent for relieving the obstruction to the flow of bile into the intestines; for restoring the gland to its healthy function; for mitigating the congestion; and for allaying the fever, by its sedative properties. It appears to act by stimulating involuntary muscular fibre, and thus relieves congestion of the blood-vessels of the liver by causing their muscular coats to contract; and, in the same manner, the obstruction in the bile-ducts is relieved, and the secretion is allowed to flow into the intestine. The action of this drug, here, is very similar to that which it has in relieving the distressing symptoms of bronchitis in the human subject; for when the mucous membrane of the bronchial tubes is dry and inflamed, it alleviates the congestion of the blood-vessels and causes a healthy secretion of mucus; and if the bronchial tubes are blocked up by mucus (phlegm), it stimulates their muscular coats to expel it. I am indebted to Mr. Kettlewell, V.S., Bengal Studs, for having directed my attention to the employment of ipecacuanha in the treatment of congestion and inflammation of the liver. I have used it in many cases of these affections, and always with marked success. Dr. J. Macpherson, late Inspector General of Hospitals, Bengal Army, speaks highly of its employment, in large doses, for inflammation of the liver in human practice.

Alkalies, such as the bicarbonate of soda, are very useful; for, according to Bence Jones, they greatly assist in the oxidation of the products of unused nutritive matter and of broken-up tissue in the blood, which products the liver is called upon to convert into substances of which the kidneys can speedily get rid.

Sal-ammoniac exercises a powerful influence in relieving the functional circulation of the liver. As the amount of nitrogenous solids in the urine increases largely after its use, we may surmise that it tends to restore to the liver its healthy function of purifying the blood by aiding in the formation of these products. It may be used in combination with alkalies or mineral acids. It is also a good stimulant.

Salts of iron should not be given; as—probably on account of their astringent properties—they almost invariably aggravate the disease. If a tonic be required, we may try nux vomica, gentian, or chiretta.

PRACTICAL TREATMENT.—Agreeably to the foregoing remarks we may give, on one or more occasions, as a drench—

Epsom salts	8 oz.
Water	3 pints.
Treacle	A sufficiency.

Give 2 drachms of ipecacuanha in a ball twice a day for a week, or for a shorter period in the event of the gums and insides of the eyelids recovering their usual healthy hue before that time. Administer, as a drench, an ounce of sweet spirits of nitre in a pint of cold water, two or three times a day. The Epsom salts and sweet spirits of nitre may be given as the symptoms seem to indicate. An enema of warm water should be administered from time to time, if the constipation continues.

Apply warm fomentations over the liver (on the right side), and keep the horse warmly clothed and stabled. Allow him bran mashes, roots, green fodder, and plenty of water to drink. A little gentle exercise—say, a walk for a mile or two, once or twice a day—may be given at discretion.

Two ounces of bicarbonate of soda mixed in the daily allowance of food, and half an ounce of sal ammoniac in a pint of water, as a drench, three times a day, can be tried with advantage.

Chronic Inflammation of the Liver.

The same causes induce both chronic and acute inflammation of the liver. The former, generally, comes on after repeated attacks of the latter.

NATURE OF THE DISEASE.—In chronic inflammation of the liver, there is a large increase in the amount of the fibrous tissue of that organ, which causes, by pressure, more or less obliteration of the bile-cells (which are the secreting elements), and also hinders the circulation of blood through the liver, and consequently gives rise, in some cases, to abdominal dropsy (ascites), which is due to the transudation of watery fluid from the blood contained in

the portal vein and its tributaries. These vessels become greatly congested on account of the passage of blood supplied by them being obstructed. As a rule, in this disease, the liver shrinks to a good deal less than its natural size. It may, however, become enlarged, or may remain unaltered in bulk. Too high feeding, particularly in hot climates, may lead to fatty or other degeneration. All these changes will most materially impair the working efficiency of the liver. The proper treatment will naturally consist in feeding the horse on food which has the least possible tendency to overtax his liver; and we may depend on bicarbonate of soda and sal-ammoniac as the safest and most efficient medicines. Respecting their actions see page 541.

SYMPTOMS AND TREATMENT.—This disease is rather obscure in its nature. The cases which I have seen in India, presented but few characteristic symptoms to guide the observer. There was always depression of spirits; loss of appetite for corn, although the animal would eat plentifully of green meat of every sort; wasting of the muscles, which was very apparent over the hind quarters; and the animal often became pot-bellied. The bowels were generally constipated; the dung lighter coloured than natural; and the gums and lining membrane of the eyelids pale, and tinged with yellow. The coat did not seem to become affected. I have found that, in these cases, the animal got considerably better on a course of green fodder, roots, and regular, though moderate, exercise, and now and then a short course of bicarbonate of soda, or sal-ammoniac; but that, if he was restricted to "hard" food, he would rapidly lose the little condition he had "put on," and that the mucous membranes would become yellow, and the mouth would acquire a sour smell. I have rarely seen a radical cure affected in the case of a horse suffering from this disease in India.

The appropriate treatment would be green food, attention to ventilation, a free supply of fresh air, and moderate exercise. Two ounces of bicarbonate of soda may be given in the food daily, and half an ounce of sal-ammoniac in a pint of water three times a day. These medicines may be continued for a month, or longer.

Biniodide of mercury ointment (1 to 16 of vaseline or lard) might be rubbed on the skin over the region of the liver, with the object of causing absorption.

CHAPTER XXIV.

Nervous Diseases.

KUMREE—PARALYSIS OF THE LOINS FROM SPINAL CONGESTION—STRINGHALT—AUSTRALIAN STRINGHALT—CRIB-BITING AND WIND-SUCKING—SHIVERING—IMMOBILITÉ—PARALYSIS OF THE FACE—MEGRIMS, STAGGERS, AND EPILEPSY—SUNSTROKE.

Kumree.

Horses are liable to suffer, especially in India, from paralysis of the loins which comes on as a disease in itself, and is unconnected with mechanical injury to the part. As a rule, there is very little constitutional disturbance. This paralysis appears under two forms: the one being gradual in its approach; the other, sudden. Although the two diseases are almost identical in their results, they appear to be entirely different in their nature, one from the other. As the paralysis, which comes on without warning, is met with all over the world, being probably due to spinal congestion, and as the other seems to be peculiar to India (where both forms are known as kumree), and, perhaps, Burmah; I shall reserve for the latter the term, kumree, which, being derived from the Persian word, *kumr*, the loins, means something affecting that part.

LOCALITIES IN WHICH KUMREE IS PREVALENT.—Owing to the confusion which has existed in the minds of observers, between the paralysis caused by kumree and that due to spinal congestion, I find it difficult to specify the localities in which these affections are, respectively, rife. There is no doubt that kumree is frequently seen in Bengal and Behar. The paralysis of the loins, which is very common on the Malabar coast, and which is met with in other parts of the Indian Empire, in Burmah, Mauritius, and also, I am informed, on the West Coast of Africa, is, I venture to say, due to spinal congestion, in the great majority of cases. I must confess that although I had formerly observed a large number of instances of paralysis of the loins, among horses, in various

parts of India, I failed, during a long residence in that country, to draw the distinction which more matured judgment now forces upon me. Kumree is specially prevalent in swampy districts which are liable to inundations. Colonel Meyrick observes, with respect to this variety, that "the disease was very common amongst the Government brood mares at Buxar, where one of the late Bengal studs was situated, when I was in veterinary charge of it ten years ago. The country all round was inundated to a considerable extent during the months of July and August, the land gradually drying in September and October. The mares were kept by native farmers, who were bad horse-masters, and, frequently, fed them upon coarse indigestible kinds of grass cut from the bed of swamps."

HEREDITARY PREDISPOSITION.—I learn from the Bengal Stud Records that kumree is not transmitted by parents to their offspring. A stallion, therefore, if paralysed to but a slight extent, may be used to breed from. A mare similarly affected will rarely be able to bear the weight of the horse.

CAUSES.—I am strongly of opinion that kumree is caused by parasites which are taken in with the food or water, are absorbed into the blood, and are deposited in the brain or spinal cord. Evidently referring to this form of paralysis, Meyrick observes that it "is most common in districts which are swampy or subjected to inundations during the rainy season, and this fact increases the probability of its parasitic origin." The theory that a horse affected by "worm in the eye" will subsequently suffer from kumree has been frequently advanced in India. Experience, however, does not bear it out. We may safely say that there is no necessary connection between the two diseases; although it is quite possible that the presence of one or more filariæ (p. 406) in the brain or spinal cord might set up inflammation, which would assuredly cause pressure on the nerves and consequent paralysis. This theory of the origin of kumree is mere supposition, which is, however, to a certain extent, borne out by facts connected with its causes and mode of invasion. Taking for granted the parasitic nature of the disease, there is little doubt but that the worms would be brought to their resting-place in the form of eggs, which would take some time to become hatched and developed, and would give rise to symptoms that would slowly and gradually manifest themselves.

Some observers consider that kumree is caused by the eating of ergotised grain, the action of which is specially manifested by impairment of the general health, and may be followed by grave de-

rangements of the system—paralysis among the rest—a train of symptoms which does not suggest kumree. The symptoms of kumree in no way suggest that this disease is caused by the eating of lathyrus sativus (p. 588).

As a PREVENTIVE MEASURE, in districts where kumree is known to appear, care should be taken that the grass is not cut from swampy or lately inundated lands, and that it is not washed in stagnant water—as is frequently done in India—before it is brought in. A full quantity of salt ($3\frac{1}{2}$ oz. daily) should be given with the food, or rock salt should be kept in the manger.

THE LAMENESS OF KUMREE is characterised by marked weakness in the hind quarters. In the early stages, the animal will walk and trot fairly well, although with a certain loss of freedom in his hind action. He turns, however, with difficulty, from want of proper control over his hind legs. If forced to back, he will exhibit more or less inability to support his hind quarters, or may even sit down on his haunches. Generally, the animal will be unable to bear the weight of a rider on his back, and may even crouch down if the loins are pressed upon by the hand. In confirmed cases, he "drags" his hind legs—usually one more than the other—fails to advance them with precision, and can progress but slowly. If backed, or even turned sharply, he is liable to fall.

SYMPTOMS OF KUMREE.—As a rule, the symptoms come on very gradually, and may take three or four months to become fully developed. At first, there is nothing to indicate the mischief beyond a trifling awkwardness in the animal's hind action, which, on being observed by persons well acquainted with the symptoms of kumree, might elicit the remark that the horse was beginning to "go in the loins;" although he might be still able to perform his accustomed work in a fairly efficient manner. We shall, probably, then find that he will get gradually worse, until, after a few months, he will become quite useless.

Softening of the spinal cord is the chief peculiar appearance observed after death.

CHANCES OF RECOVERY.—I think that paralysis from spinal congestion is more likely to get well, other things being equal, than that from kumree. I have never heard of recovery after a severe case of either variety. A horse which has had a comparatively mild attack, may improve sufficiently for light harness work, or may even, in exceptional instances, become all right again. If the symptoms do not mend, the probability is that the animal will

gradually become worse, and die after some months. In both forms of paralysis of the loins, the chances are greatly against the patient.

TREATMENT OF KUMREE.—Blister or fire over the loins, and give nux vomica, as recommended on page 548. The compounds of iron, as observed by Meyrick, being poisonous to many of the lower forms of life; 2 drachms of sulphate of iron may be given in the food daily, as well as iodide of potassium, from time to time.

Paralysis of the Loins from Spinal Congestion.

The following remarks on this form of paralysis, should be read in connection with the preceding section:—

There is but little doubt that the paralysis of the loins which is sudden in its attack, and which is met with in various parts of India and other hot countries (p. 543), and also, though less frequently, in temperate ones, is often due to congestion of the spinal cord. In the East, it is common in places which have a damp, warm climate, and which are subject, at times, to cold, dry winds, especially east winds, if in the interior; or "land winds," if on the sea-coast.

This paralysis is sometimes met with in Cambridgeshire—where I have seen cases of it—and other fen counties. Chill seems to be the usual cause of this complaint, to alleviate which, treatment appears to be of little avail.

BREEDS OF HORSES MOST SUBJECT TO THIS PARALYSIS IN INDIA.—In India, Arab and Australian horses are peculiarly liable to spinal congestion. As they are the only horses which are imported in large numbers into India, we may reasonably conclude that any other foreign animals would be equally susceptible. Indigenous ponies, and, to a less extent, indigenous horses, enjoy a comparative immunity. My experience is that Arab stallions are much more liable to get this disease than any other kinds of horses. With very few exceptions, the Arabs which are imported into India and other countries, are entire; and geldings predominate to an equal extent among the Colonial importations. The proneness of Arab entire horses to this complaint is usually attributed to the fact that a large number of them contract the habit of masturbation, and thereby weaken themselves. I have observed that Arab race-horses which are properly looked after, rarely get paralysed in the loins.

SYMPTOMS OF SPINAL CONGESTION.—The symptoms become developed without warning. Often the horse is found, on the

groom coming into the stable the first thing in the morning, to be more or less paralysed in his hind quarters. Or, having carried his master in the early morning with all his wonted power and dash, he may be discovered, similarly affected, after having been left for a few hours in his stall, where, it is probable, he has received a chill after work. In some cases, the attack is so severe that the animal is unable to stand from the commencement, and dies in a few days from exhaustion, brought on by excitement and other nervous derangement. Generally speaking, as long as the animal is able to keep on his legs, he shows but little signs of constitutional disturbance. Sometimes, the attack is so mild, that the horse continues capable of being ridden and driven, although he will exhibit a certain loss of power in bearing weight, and, also, in bringing his hind legs forward.

The lameness from spinal congestion closely resembles that from kumree (p. 543).

If the animal does not die from the severity of the attack, the disease will generally run a chronic course, and the horse may slightly improve with time; may get comparatively well; or may become gradually worse, and die after a few months.

CAUSES.—There seems to be but little doubt that this paralysis is caused by chill, and is due to congestion of the spinal cord, on account of which there is an exudation of watery fluid from the blood-vessels into the spinal canal, with consequent paralysis from pressure on the cord. The all but universal idea in India is that this paralysis is caused by the influence of cold winds; hence, its common designation, "a stroke of the wind." It is a well-established fact that in places where spinal congestion is rife, cases are especially liable to occur when a cold, dry, night wind springs up after a sultry day. "Mr. Hallen, Inspecting Veterinary Surgeon of the Bombay Army, has stated that in one instance he stopped its recurrence in a native cavalry regiment, where it had been prevalent, by building a wall high enough to shelter the horses from wind" (*Meyrick*). The baneful effects of chill, particularly in warm climates, are far greater when the air is laden with moisture, than when it is comparatively dry; because, under the former condition, evaporation from the skin is checked, sweat bedews the body, and the superficial vessels are congested. If, when in this state, the animal be exposed to a cold, dry wind, there will be contraction of the blood-vessels of the surface of the body, with a corresponding rush of blood to the underlying tissues, which determination of blood may cause congestion of the vessels of the spinal cord, with consequent paralysis. The effect of the direct and powerful rays of the sun, probably, predisposes the cord

to become thus affected, or may even bring about degenerative changes in that nerve centre.

POST-MORTEM APPEARANCES.—The appearances of recent cases of this disease are those of congestion of the cord at the loins, with, consequently, a large amount of serum (over 12 oz. in one case, according to Colonel Fred Smith) in the spinal canal. Observers are generally agreed that in old cases—no distinction being made between it and kumree—there is always softening of the cord at that part.

TREATMENT OF SPINAL CONGESTION.—Give, in the first instance, a dose of aloes. Blister along the spine, over the loins, with biniodide of mercury ointment (1 to 4 of lard); and mix 1 oz. of iodide of potassium in the food or water daily for a fortnight or so. Keep the animal warmly clothed and stabled, and give green food. If the patient can stand fairly well, slings may be of use; for it is quite possible that the local congestion might be increased by lying down. If the paralysis be considerable, slings should not be employed; as the consequent pressure on the abdomen would interfere with digestion. If the animal is unable to stretch himself out in order to urinate, the catheter should be passed four or five times a day.

The action of the purgative is to determine blood to the intestines, and, consequently, to draw it away from the congested part; while, by diminishing the amount of watery fluid in the blood, it hastens the absorption of the exuded serum. The effect of the counter-irritant (p. 17) on the skin is to diminish the blood-pressure of the congested vessels, and, consequently, to relieve the unhealthy condition which they are in. As contraction of the superficial vessels is the original cause of the congestion of the vessels of the cord, it is reasonable to conclude that dilatation of the former will be followed by more or less contraction of the latter. The action of the iodide of potassium is to cause absorption of the serum.

A fortnight or so after the commencement of the attack, we may consider that the inflammatory stage has passed, and we may then limit our treatment to giving a drachm of nux vomica morning and evening in the food, and to repeating the blister. As a last resource, the horse may be fired along the spine over the loins. The nux vomica should be discontinued as soon as nervous twitchings make their appearance in the muscles of the animal, or when his appetite begins to fail.

PREVENTIVE MEASURES.—The horse should be warmly clothed, according to the season of the year, at night, and at other

times when the temperature of the atmosphere is liable to fall. Precautions should be taken to prevent the animal getting chilled, especially after work. His body should not be washed. It is a good plan, in tropical climates, when the horse is picketed in the open, to protect his spinal cord from the direct rays of the sun, or from chill, by placing a folded blanket over his back and loins. The horse should have the protection of a wall between him and the quarter from which cold winds may be expected to blow. Of course, these precautions are necessary only in places where the disease is common.

Stringhalt

is a symptom of disease or injury, and is characterised by the hock being more energetically flexed (bent) than it is extended during movement. In mild cases, this want of co-ordination may be noticed only when the animal begins to move, or from time to time as he progresses. It is sometimes intermittent, as, for instance, it may be present one day, and may be absent, after that, for one, two, or three days. In bad cases, it may be seen at every step he takes. It is almost always confined to the hind legs, and occasionally affects both of them. In nearly every case it gets worse with age, and becomes aggravated by hard work and injury. Twenty years ago, it was comparatively common among Edinburgh cart-horses, the extensor muscles of whose hind legs had to perform very severe work, when ascending the steep inclines that are in that city.

Many theories have been put forward as to the cause of stringhalt, which is generally regarded in this country as a nervous disease. This supposition is, I think, strengthened by the fact that a leg which is affected with stringhalt is almost always in an abnormally high state of sensibility. Whatever may be the cause, the fact remains that diminution of the muscular power which bends the hock, reduces as a rule the defective action, and renders it normal in many cases. With this object, one of the muscles which helps to bend the hock (the peroneus) is thrown out of action, by removing a portion of its tendon. If the tendon was simply divided, it might reunite later on. This operation is performed on the outside of the leg and just below the hock. It should, of course, be done under antiseptic precautions (p. 70).

I think slight cases of stringhalt are more readily seen in the box or stall, on turning the animal round to one side and then to the other, than when he is taken outside.

TREATMENT is generally of very little use, except, perhaps, in mitigation, when the affection has been made worse by over-exertion

or injury, in which case, rest, physic, and warm fomentations might be employed. Slings would be of special use, in order to give rest, if the animal was not inclined to lie down.

LEGAL ASPECT.—Stringhalt is an unsoundness (Thompson *v.* Patteson, Oliphant's "Law of Horses"), on account of its always giving rise to lameness. In Anderton *v* Wright (Wigan County Court, 1871, "Veterinarian" for 1871, p. 522), "His Honour said that it was perfectly clear that stringhalt constituted unsoundness."

This disease not only impairs the present and future usefulness of an animal, but it also, as a rule, greatly increases the difficulty of treatment in case of injury to a limb affected with it, on account of the unnaturally high sensibility of the part.

Australian Stringhalt.

SOURCES OF INFORMATION.—This disease, which appears to be of a nervous origin, is peculiar to Australia, where it affects large numbers of horses in certain districts. As I have no practical acquaintance with it, beyond seeing two or three cases of it in horses which were imported to Calcutta from Melbourne, I have taken the following notes and extracts from veterinary reports made to the Minister of Agriculture for Victoria (Australia) by Mr. W. T. Kendall, M.R.C.V.S. (Principal of the Melbourne Veterinary College) and Mr. Edward Stanley, F.R.C.V.S., both of whom have had much practical experience of it.

HISTORY.—As far as Mr. Kendall can learn, Australian stringhalt was not seen before 1865 or 1867 in Victoria, where it made its first appearance in some of the oldest-settled districts, such as Dandenong, Heidelberg and Fern-Tree Gully. It seems to have been imported to New South Wales from Victoria.

OCCURRENCE.—Mr. Kendall states that it appears to follow in the wake of agriculture, and that it breaks out most frequently in paddocks which have been ploughed and then laid down in grass, although it is not exclusively confined to them. As a rule it prevails in low-lying rich lands and river flats, but sometimes it occurs on high ground. It always comes on suddenly, and without any assignable cause.

CONTAGIOUSNESS.—Mr. Stanley gives several instances to prove his reasonable assumption that an animal suffering from Australian stringhalt may indirectly communicate the disease to other horses, by contaminating the herbage on which they are grazing.

SUSCEPTIBILITY.—Mr. Kendall tells us that it attacks all classes of horses at grass, irrespective of age, sex or condition; but that it rarely affects horses which are exclusively stable-fed. Animals under eighteen months old and small ponies are least liable. Mr. Kendall has met with a few instances of foals and yearlings which became infected. Horses which are at grass with cattle and sheep, seem to be less prone to take the disease, than when these ruminants are absent.

Australian stringhalt is generally regarded as peculiar to horses, although Mr. Kendall suspects that an outbreak of disease which he observed among 20 store cows, was due to it. "Further proof is wanting to establish the identity between this and the disease from which the horses died; but the fact of so many cattle being affected in the same way at the same season of the year, and in a paddock adjoining the one where the horses were, is worthy of being placed on record."

SEASON OF ATTACK.—"It is usually about the autumn when the disease makes its appearance" (*Kendall*).

CAUSE.—No exact information is available as to the producing agent of Australian stringhalt. The following are some of its supposed causes:—

1. The eating of so-called dandelion (*Hypochœris radicata*), which was introduced into Australia from Great Britain, and which is known as cat's ear or flatweed. The fact that it "has no connection with Australian stringhalt is proved by the great numbers of horses eating it, and never having the disease. It is known to exist in localities free from this weed, which has no medical or poisonous properties" (*Stanley*). Besides, it is not a disease producer in the country of its origin.

2. "The Richmond outbreak was attributed to a metallic poison known as *venadium*, which was found, on analysis, to exist in the clay taken from the water-hole supplying the affected paddock, the water being very low at the time; and the fact of the disease being only in this paddock, and recurring year after year in it, strengthened the assumption. . . . At Camden, where the disease was very severe, and in one paddock only, the water supply was from a running stream, and no venadium could be detected, so the venadium theory is untenable" (*Stanley*).

3. The fact that the disease is confined to Australia, shows that it is not caused by chill, rheumatism, or any of the known kinds of intestinal worms, ticks, or blood-sucking flies.

4. A study of the respective symptoms and course of kumree (p. 543), ordinary stringhalt (p. 549), and chorea (St. Vitus's dance)

proves that none of these diseases is similar to Australian stringhalt.

DURATION OF AN ATTACK.—"The attack is sudden in all forms of the disease. A horse may apparently be in good health one day, and on the next be badly affected, and it not unfrequently happens that the horse remains in the same state in which he was found, for nine, twelve, or eighteen months. In slight cases he may recover in five or six months, but the average duration of the disease is about twelve months. Sometimes a horse may remain affected, but be able to work for years; recovery, however, usually takes place sooner or later without treatment of any kind. When the disease proves fatal, death usually takes place about the fourth or fifth day from the commencement" (*Kendall*).

VARIETIES OF THE DISEASE.—Mr. Kendall considers that this malady has three forms, namely, local, general, and acute general.

"SYMPTOMS OF THE LOCAL FORM.—This is the most common form of the disease, and is characterised by a peculiar jerking action in one or both hind legs, which may be so slight as to be noticeable only when the animal is suddenly turned round or made to go backwards; but in more severe cases, both hind legs may be so badly affected that progression can only be accomplished by a succession of bounds and plunges extremely painful to witness.

"There is no involuntary twitching of the limbs as in chorea (St. Vitus's dance), and it is only during movement or attempted movement that the convulsive action is observed. In cases where both legs are badly affected, when the horse desires to move forward, the hind quarters are suddenly elevated, and one hind leg is violently jerked upwards, sometimes so high that the foot strikes the belly and remains so drawn up. The other is then brought up in a similar manner, the former being at the same time suddenly brought to the ground with great force. At other times, both hind legs will be jerked up simultaneously, or in quick succession, and the hocks remain flexed to their utmost extent, until the haunches almost reach to the ground, before the horse has power to bring the feet down.

"In this form of the disease there is generally a great falling off in condition, the animal having a careworn, tucked-up appearance.

"The appetite is almost invariably good, and the digestive and urinary organs appear to perform their functions properly. The pulse is usually quick, even in cases of long standing. In one case,

where the horse had been affected over eighteen months, the pulse was taken on three different occasions, and numbered sixty each time.

"This form of the disease seldom proves fatal, and affected animals usually recover without treatment, in from twelve to eighteen months, and I have heard of very few instances of horses having a relapse after improvement has set in. As soon as the warm weather comes, the symptoms gradually disappear, and the horse resumes control over the motions of his limbs, and regains his condition. If put to light work and well cared for, recovery seems to be hastened.

"SYMPTOMS OF THE GENERAL FORM.—This form of the disease is mostly confined to the lighter breed of horses, and usually affects a greater percentage of the horses on the paddocks or farms where it prevails, than the previous form; but is not so widely distributed and occurs only in certain seasons. The fore legs are generally affected as well as the hind ones, but instead of being jerked up like the latter, they are carried stiffly forward, the knee being scarcely bent at all.

"The toe is dragged along the ground, and the animal stumbles awkwardly. When undisturbed, a horse affected in this manner may pasture and get about without much difficulty, but cannot get along at all under excitement.

"I have gone into a paddock where a number of horses were grazing, and could scarcely see anything the matter with them, until I rushed suddenly amongst them, when they immediately began to plunge and flounder about in all directions. Some of them would fall over, and others, after making one or two violent struggles to get away, would come to a sudden standstill as though rooted to the ground, their heads being elevated and nostrils dilated, gasping, as it were, for breath, and making a loud roaring or flapping sound during respiration. If near enough, the heart may be heard beating violently. When there is plenty of grass, there is not much loss of condition in this form of the disease, and with the exception of the above symptoms in varying degrees of intensity, horses thus affected are apparently in good general health and spirits.

"SYMPTOMS OF THE ACUTE GENERAL FORM.—This form has never appeared to my knowledge, except in isolated cases, until the present season (1885), and to it is attributable the recent heavy mortality amongst horses in Gippsland.

"The symptoms differ considerably from those of either of the other forms, but as all three are found affecting different animals

in the same mobs at the same time and under precisely similar circumstances, it is evident that they are only modifications of the same disease, and are due to the same cause or causes.

"The first indication of the disease is an alteration in the animal's gait. There is a dragging in all the limbs and frequent stumbling; the hind fetlocks knuckle over, and the thighs have a thin wasted appearance, when viewed from behind. The horse stands and moves in a crouching manner; the hind quarters being carried low, and all the joints of the hind limbs flexed. In some cases the muscles of the shoulders also become atrophied. If the horse is made to move any distance, he breaks out into a perspiration. As in the other forms of the disease, the attack is usually very sudden, and the sudden wasting of the muscles is not so easily accounted for. If the horse should fall or lie down, he may be unable to rise, and, if not properly attended to, death usually takes place about the third or fourth day. When down, the animal struggles violently, and often paws great holes in the ground, using the hind legs as well as the fore ones, thus showing that the inability to rise is not due to paralysis of the hind extremities, as some suppose; for if raised by means of slings, he can both stand and walk; and if the horse has not lain too long before assistance is given, and is properly attended to afterwards, he usually recovers. When standing, the weight is frequently shifted from one hind leg to the other, and the limb that is being relieved is suddenly snatched up, though not to the same extent as in the other two forms of the disease. The crouching attitude with the knuckling over of the hind fetlocks is maintained in standing, and the animal is often wet from perspiration as if from pain. The fetlock joints are often hot, tender and swollen. The appetite is generally good in all forms of the disease, and even when down in the last-described form, the horse will often eat up to the last. Beyond perhaps a little constipation, the bowels remain unaffected, and the urine is voided in the usual quantities without difficulty. The pulse is invariably quick in all forms of the disease, is often weak, and sometimes both irregular and intermittent, showing that the action of the heart is disturbed. The breathing is not materially affected, except when the horse has been disturbed, or is suffering more than usual pain. The internal temperature did not vary more than one or two degrees beyond the normal, in any of the cases that came under my notice. The mucous membranes are usually normal, though sometimes there may be a slight yellowish tinge. The first sign of recovery in this form is a gradual straightening of the hind fetlocks, and disappearance of the pain and nervousness; but the muscles of the thighs and shoulders are slow to regain their ordinary form" *(Kendall)*.

"PREVENTION.—From what has already been stated, it is clearly evident that a change of pasture, as well as of locality, is one of the surest means, not only for preventing the disease, but also for hastening recovery in those already affected. Pasturing cattle or sheep along with horses appears to have a beneficial influence. Overstocking and long-continued pasturing exclusively with horses should be avoided, especially on land that has been under the plough and afterwards laid down with cultivated grasses.

"TREATMENT.—Of this little can be said, except that all sorts of remedies, both likely and unlikely, have been tried, chiefly by unskilled hands, with about an equal amount of success. A change of locality, especially if a dry, well-sheltered paddock is chosen, and the warm summer weather seems to hasten recovery, which is invariably tardy under all circumstances. Some good has been thought to have been done by applying pitch plasters and blisters etc., along the back, and by the internal use of salts of soda and potash, colchicum, nux vomica, and various other drugs, and by repeated physicking, warm clothing, etc.; but it seems doubtful whether the cases that have been so treated, would not have recovered quite as soon if they had been left to themselves, as they almost invariably do in the first two forms of the disease. In the third form it is necessary to tend and nurse the sick animals, and to use slings when they are unable to rise from the ground. When this is done in the early stages, and the animals are fed on good nourishing food, they are soon out of danger, and recovery, though slow, is pretty certain.

"Blistering the fetlock joints seems to have had a beneficial effect in a few cases where it has been tried" (*Kendall*).

Crib-biting and Windsucking.

DEFINITION.—Cribbing and windsucking are two forms of the same vice, in the practice of which, the horse, while standing still, draws air into his mouth, makes a convulsive effort to swallow it, and then, generally, emits a guttural noise. If, for the exercise of this habit, he needs the support of some fixed object, he is said to be a crib-biter. If he does not require it, he is called a windsucker. In a few confirmed cases, the animal will crib, if a suitable support be present; but if it be absent, he will windsuck. Although the change at present might be too much opposed to long-established custom to warrant its adoption; I venture to suggest for future consideration, "air-swallowing" as a general term for cribbing and windsucking, and would call the former,

"air-swallowing with support," and the latter, "air-swallowing without support."

METHODS OF PRACTISING THE VICE.—The cribber selects his object of support at such a height from the ground that, while using it and while standing up, he will be able to draw in his chin towards his breast and arch his neck. The supporting object will therefore never be on the level of the ground or placed high up; for to reach it in either of these positions, he would have to stretch out his head and neck. I have never heard of a case of a horse cribbing or windsucking while lying down. The cribber, when tied up in a stall, will generally utilise for the practice of his vice, the edge of the manger or rack-chain; as these are usually the most convenient objects within reach. Horses have been known to crib on one of their forelegs. The cribber shows little or no preference, however, in the stable or out of it, so long as the selected object serves his purpose. As a rule, he seizes his point of support with his front teeth, which consequently become worn, chiefly, as follows:—

1. By the front (and in exceptional cases, the rear) edges of the teeth becoming more or less irregularly bevelled (Figs. 147, 148 and 149).

2. By the teeth becoming shortened. We may here recognise the effect of the wearing-down process, by taking a front view of the teeth (Fig. 150).

3. By the teeth becoming bevelled and shortened.

In the foregoing cases, the wear is almost always confined to the front and middle incisors (nippers). We can see that in Fig. 148, three of the corner incisors were also implicated.

4. Goubaux and Barrier state that the cribber, in the practice of his vice, may effect vertical grooving between the incisors by friction against the rack-chain, and that, when such an animal wears a groove between one pair of incisors, so deep as to hurt his gum, or to reach the sensitive portion of the teeth, he will try another pair of incisors; and so on.

All these forms of wear, more or less complicate the determination of age by the teeth.

Many horses, though free from the vice of crib-biting, wear their teeth in a manner somewhat like that of cribbers, on account of biting at their manger, etc., from irritability, when being groomed, and sometimes from idleness. Here the question as to the animal being a cribber, will be determined by the absence or presence, on his part, of any attempt to swallow air.

Cribbing, "however, is not always characterised by wear of the teeth. The support may be taken by the lips, chin, lower edges

of the branches of the jaw, and in exceptional cases by the throat just below the larynx" (*Cadéac*).

When the cribber has obtained his required support, he will take air into his partly-opened mouth, and having drawn in his chin towards his breast, and arched his neck, he will make a convulsive effort to swallow the mouthful of air; and at the same time will, as before said, emit a characteristic grunt. By drawing his tongue backwards and upwards, he will raise the soft palate, and will close the air-passage which leads into the nostrils, and will also close the entrance into the windpipe.

"The windsucker, generally, begins by backing away from the

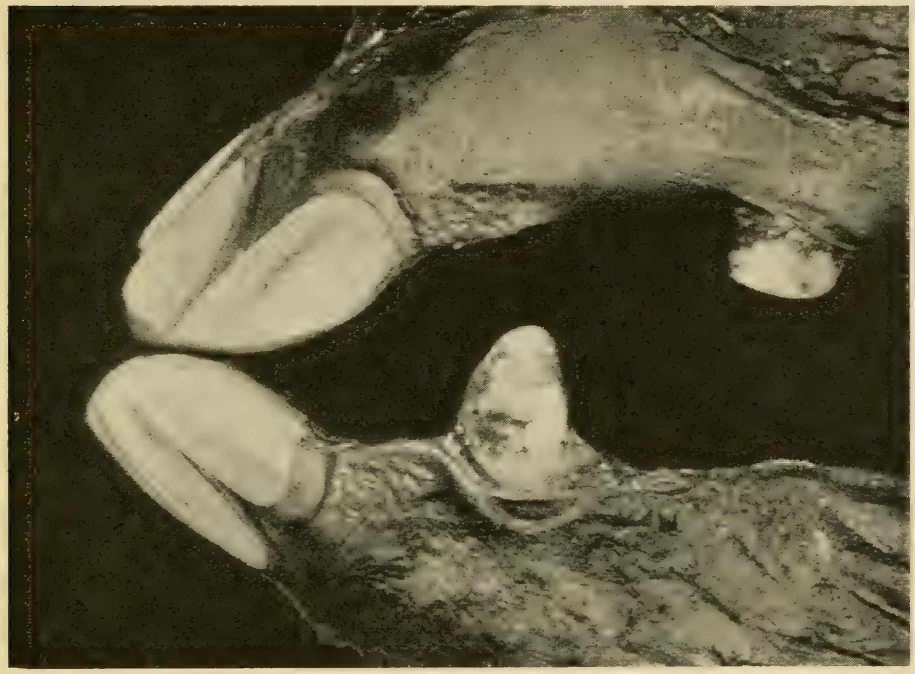


Fig. 147.—Side view of the incisor teeth of a crib-biter, 30 years old (same as shown in Fig. 148).

manger; poking his nose out; sucking air into his mouth, as may be seen by the forward and backward movements of his lips, which he sometimes smacks together, or rolls them from one side to the other as if he was trying to form in his mouth a bolus of food in order to swallow it. At the same time, he places his tongue against his palate. He may stop at this point, in which case his effort will end only in the swallowing of saliva, which does not satisfy him" (*Cadéac*). In well-developed cases, he draws in his chin towards his breast, arches his neck, and violently contracts the muscles of deglutition in the same manner as the cribber, in his effort to swallow the mouthful of air, which, on account of its ex-

treme compressibility, he finds difficult to "get down." It has often been remarked that an old cribber or windsucker may be known by the unusually large development of the muscles (*sterno-maxillaris* and *omo-hyoideus,* among others) which the practice of his vice calls into play.

Farges gives an instance of a foal practising it at three months, and others at six months old.

CRIBBING AND WINDSUCKING BY ANIMALS OTHER THAN THE HORSE.—Several cases of cribbing and windsucking by horned cattle, and of cribbing by pigs are on record. Cadéac states that mules have never been known to be affected with either form of this vice.

Aerophagia (air-swallowing) is recognised as a nervous disease in human medicine. "In the Edinburgh Hospital Reports of 1895, Dr. John Wyllie has described the cases of neurotic individuals who acquired the power of creating by muscular action negative pressure in the œsophagus and thus sucked air into their stomachs. In the *Lancet* of August 1st, 1896, p. 304, Dr. G. A. Sutherland published a case of this kind. Dr. Wyllie terms this condition 'air-sucking' and distinguishes it from air-swallowing. The case of one of Barnum's 'freaks,' who could, by swallowing air, pass rapidly from the appearance of emaciation to corpulency, may also be mentioned" ("Lancet").

NATURE.—It appears that the horse requires practice to successfully accomplish the effort which he makes to swallow air when cribbing or windsucking. Hence, we find as a rule that marked flatulent distension of the abdomen, as a consequence of the action of this vice, is present only in confirmed cases. When there is no distension, we may assume that but little air is swallowed, or that the air which is taken into the mouth is expelled from it when muscular relaxation occurs after the spasm peculiar to the vice has taken place. Both forms of this vice get worse with age.

Windsucking, which is much rarer than cribbing, appears to be the more developed form of the two; for its practice is far more frequently followed by flatulent distension than that of crib-biting.

Cadéac cites, among others, the following proofs that air-swallowing and not eructation (belching) is the essential act of cribbing and windsucking:—

1. The attitude of drawing in the chin and rounding the neck, in which this vice is practised, is that of swallowing and not of belching, in which the head and neck are extended as much as possible.

2. If the gullet of the cribber or windsucker be laid bare, we

can observe during the practice of the vice, that a gulp of air passes down the gullet in the direction of the stomach.

3. Owing to the peculiar construction of the horse's stomach, which, under ordinary circumstances, does not permit of vomiting, we may, in the dead animal, fill the stomach with air from the bowel end, without any of the air escaping into the gullet.

4. The gas in the stomach and first part of the intestines of wind-suckers, has been proved by chemical analysis to consist exclusively of ordinary air.

5. If this vice were characterised by belching, the employment

Fig. 148.—Front view of the incisor teeth of a crib-biter, 30 years old. N.B.—The tushes of the lower jaw are in view, owing to great age.

of means that would prevent its practice would naturally be followed by flatulent distension of the abdomen, which, however, does not ensue if such preventive means be used.

6. Gerlach and Hering have proved that the division of certain swallowing muscles (*sterno-hyoideus*, *sub-scapulo-hyoideus*, and *sterno-maxillaris*) will stop the vice for the time being.

To me, a thoroughly satisfying proof that swallowing air and not its eructation is the essential act of this vice, is the fact that placing in the animal's mouth a bridle with a hollow mouthpiece perforated with holes (p. 562), will prevent its practice. We can easily see that the use of this contrivance, by furnishing, at each

side, a way of escape for the air, will render it impossible for the horse to force backwards the air in his mouth; and that it can in no way check eructation.

The swallowing of air in cribbing or windsucking appears to serve no useful end; for its prevention does not injure the health in any way.

FREQUENCY OF THE ACT AND MODIFYING CIRCUMSTANCES.—The frequency of the practice of this vice varies greatly in different cases. "We may see animals engaged at it during and after feeding. Some practise it at each mouthful. Others begin only after having had their food. The nature of the food and the process of digestion have no influence on its frequency" (*Cadéac*). The affected animal loves to indulge in this vice in solitude, and will often refrain from it, if any person, and, sometimes, if another horse be present. Bellanger tells us that a cribber refrained from cribbing during the entire duration of the Italian war, and took to it again only when he returned to his stable. Ponsecchi records the same thing with respect to cavalry horses which were employed during manœuvres. Hard work often checks it for the time being, and so does illness, in which case, as Cadéac remarks, its renewal may be regarded as a sign of convalescence.

CAUSES.—There is evidently a close connection between the vice of crib-biting and the diminution of work which domesticity entails on the front teeth of stabled horses; the teeth, being a form of epidermal growth, which is stimulated by pressure (p. 190). In the case of mankind, cooking, by softening the food, is a great cause of dental decay. The human practice of chewing toothpicks, straws, and other comparatively hard substances, is an action obviously prompted by the requirements of dental growth. Horses in a state of nature use their front teeth in the prehension and pulling of their food, far more than they would do in a box or stall, especially when their hay takes the form of "chop"; hence the almost invariable tendency which stabled horses have to gnaw wood-work. I am unable to trace the connection between this habit and the serious vice of wind-sucking.

Idleness and *ennui* are two potent predisposing causes of this vice, even if they do not give rise to it. Irritability while grooming may prompt a horse to crib, by inducing him to catch hold of his manger with his teeth. "Want of food disposes horses to lick their manger and the walls of their stalls, and thus to contract this vice" (*Cadéac*). Charles Martin regards insufficiency in the volume of the food and arrangements of the manger which

facilitate cribbing as the principal causes. Mr. Crowhurst, F.R.C.V.S. (" Vet. Record," 25th Jan., 1902), takes the same view, and states that he has never seen cart horses crib, and that their immunity is due to the fact that these animals are always given bulky food. Farges has shown that heredity, especially on the

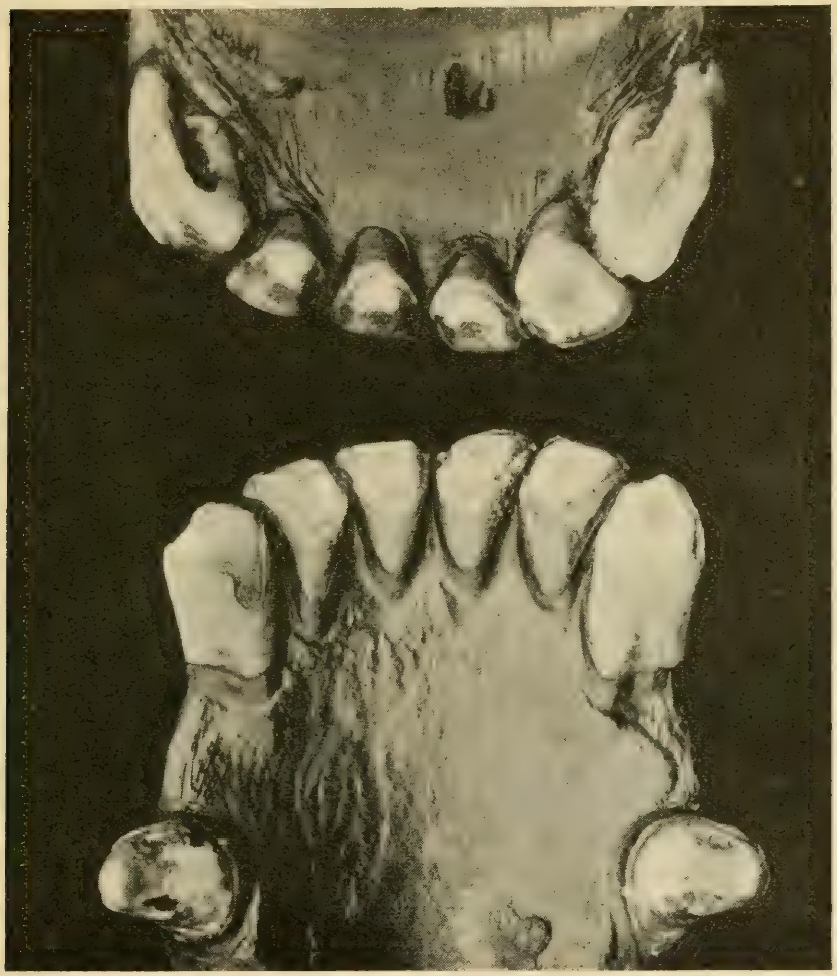


Fig. 149.—Perpendicular view of tables of the incisor teeth of a crib-biter (same as Figs. 147 and 148).

paternal side, is a frequent cause of this vice. All experienced horsemen are aware that it is often acquired by imitation, which fact, as pointed out by Farges, is true only as regards young horses. It is possible that irritation from teething or worms may induce it.

EFFECT ON HEALTH.—The practice of this vice gives rise to various diseased conditions of the alimentary canal, such as: dila-

tion of the gullet and of the stomach; injury to the walls of the stomach; and chronic inflammation of the stomach and intestines.

PREVENTION.—Being aware of the evil influence of imitation among young horses in the acquisition of this vice, we should be very careful, even among foals, to protect them against it.

The only certain means, with which I am acquainted, for preventing the cribber or windsucker from practising his vice, are those which render it impossible for him to perform the somewhat difficult feat of swallowing air, and which may be applied in the following ways:—

1. By preventing him from compressing the mouthful of air which he intends to force into his gullet. We may effect this by putting on a bridle of which the mouthpiece is a perforated cylinder. For the object in question, the natives of India have used from time immemorial this contrivance in the form of a piece of female bamboo with holes bored in it. The great objection to the carrying-out of this principle is the fact that the continued presence of any kind of bit in the mouth will make the mouth sore in a few days.

2. By preventing the animal from drawing in his chin towards his breast, which we can do by fixing a stick or other object of suitable length, below his neck, between the chin and breast.

3. By rendering the muscles which draw in the chin and which arch the neck, unable to contract. We can accomplish this by buckling a strap—which should be broad, so as to avoid injury to the mane—round the neck at its narrowest part (just behind the angles of the lower jaw), at such a degree of tightness that it will prevent the muscles from contracting, but will not interfere with the breathing or with the swallowing of food or water. We may note that decrease in the length of a muscle on contracting, is accompanied by increase in its thickness; and that the muscular effort required to swallow air is far greater than that which is necessary for swallowing food or water.

The contrivances respectively mentioned in the two preceding paragraphs, are, for increasing their effect, sometimes provided with spikes, the use of which is not without danger. The stick, strap, and other appliances for a like object, may be obtained from a saddler or veterinary instrument maker.

For preventing cribbing with the teeth, we may use, during the intervals between feeding hours, a specially made bar muzzle, which, while checking this practice, will allow the horse to eat his hay. The crib-biter may be picketed in his stall by one fore leg in front, and by the opposite hind leg behind, instead of being tethered in the usual manner by a rope or chain to his headstall. Or he may be

kept in a loose box in which there is no object for him to lay hold of with his teeth; and he may be fed from a sheet placed on the ground. If it is not convenient to do this, we may cover the edge of the manger and other prominent objects with some substance which the animal will not like to grasp with his teeth, such as that used for making iron wire mill sieves, or rope made of coarse fibres. Cocoanut (or *moonj* in India) fibre will answer the purpose. To increase the effect of these preventives, which are not always successful, we may smear the edge of the manger, etc., with some

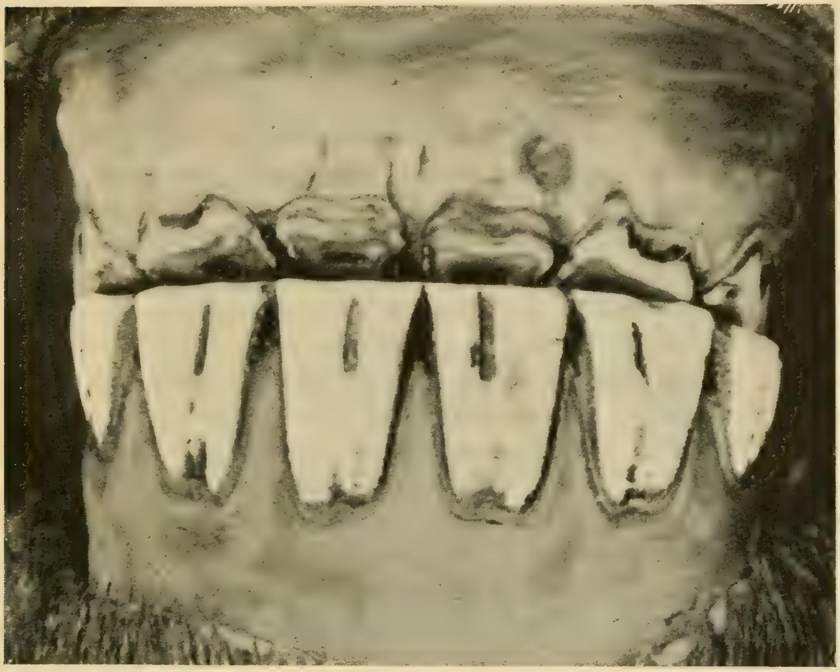


Fig. 150.—Front view of the incisor teeth of a crib-biter who wore down only his upper incisor teeth.

evil-tasting and vile-smelling substance, such as aloes or coal tar. Mr. J. Moir, M.R.C.V.S., has had excellent results in preventing horses from cribbing and in curing them of this vice, by smearing with slacked lime the wood work and other objects on which the animal cribs or wind-sucks. He prepares the lime as follows: Put the desired quantity of quicklime into a vessel, add water and stir it round until a soft paste is formed, and cover over with a little water to keep it moist.

TREATMENT.—Give plenty of hay and green food, so as to feed the animal as nearly as practicable under natural conditions.

Mr. Crowhurst wisely advises that he should be fed on the ground and not from a manger.

It is well to allow the cribber or wind-sucker (and, indeed, every horse) a constant supply of water in his stall, and a lump of rock-salt (weighing, say, 2 lbs.), to lick when he chooses.

LEGAL ASPECT OF CRIB-BITING AND WIND-SUCKING.— These habits are regarded from a legal point of view, as vices and not as unsoundness, as we may see from the case of "Scholefield v. Robb" ("Moody and Robinson's Reports," Vol. i., p. 210), which was, "on the warranty of a horse 'that it was sound and free from vice.' The horse was bought to be delivered at a future day, and the case of the plaintiff was, that the horse was a crib-biter and wind-sucker.

"Parke, B., told the jury, that if they thought the horse, at the time of its being sold, and of the warranty being given, was not a crib-biter, their verdict on both the last issues must be for the defendant; but, even if the evidence of the plaintiff satisfied them that the horse was a crib-biter at the time of the warranty, such evidence would not, in his opinion, support the allegation that it was then unsound, so as to entitle the plaintiff to a verdict on the second plea. To constitute unsoundness there must either be some alteration in the structure of the animal, whereby it is rendered less able to perform its work, or else there must be some disease. But neither of these facts had been shown. If, however, the jury thought that at the time of the warranty the horse had contracted the habit of crib-biting, he thought that was a 'vice,' and that the plaintiff would be entitled to a verdict on the third plea. The habit complained of might not, indeed, like some others (for instance, that of kicking), show vice in the temper of the animal; but it was proved to be a habit decidedly injurious to its health, and tending to impair its usefulness, and came, therefore, in his Lordship's opinion, within the meaning of the term, 'vice,' as used on such occasions as the present." We may regard this as the accepted ruling on "vice."

In the case of "Broennenburgh v. Haycock" ("Holt's Reports of Cases in Nisi Prius," Vol. i., p. 630), it was also ruled that crib-biting is not an unsoundness.

Looked upon from a practical, though not from a legal point of view, both cribbers and wind-suckers should always be deemed unsound; for the practice of their vice will, in the ordinary course of events, render them unsound; even if it has not already done so. Besides, it will diminish their usefulness, on account of the special precautions which have to be observed with them,

both in stopping the habit, and in preventing them from teaching it to other horses.

The fact of a horse being a cribber should always be mentioned in the veterinary certificate.

Shivering.

NATURE.—The equine disease which is called "shivering," is manifested by irregular and involuntary movements, generally of the hind quarters. Its symptoms somewhat resemble those of human chorea (St. Vitus's Dance), although the respective courses of these diseases differ widely from each other.

SYMPTOMS.—In "The Veterinary Record," 8th March, 1902, Mr. Hunting states that "in its early stage no symptom is diagnostic. In one case you may have a suspicious movement of the tail, in another an erratic movement of the hind legs. Sometimes the symptoms are intermittent, and not producible by any method the surgeon may adopt. At others, a sign may be developed with certainty. In the most aggravated cases, symptoms are evident which are not shown by any horse in the early stage.

"An average case of shivering may show no abnormality whilst the horse is unexcited and moving forward at a walk. When stopped suddenly, especially if drawing a load, there may be evidence of a little want of control over the movement of the hind extremities. If an attempt is made to back the horse, great difficulty is experienced and, in some cases, it is impossible. The hind feet are not raised from the ground, the back is arched, and the muscles of the quarters are rendered rigid or convulsed in a way well described as trembling or shivering. When turned sharply, the hind legs move in a jerky, uncontrolled manner. When startled or backed, the tail is spasmodically elevated, and this, perhaps, is as marked a peculiarity as any other. If an attempt is made to raise one of the hind feet, there is great difficulty. If it be successful, the limb is snatched up, and the muscles of the thigh and quarters show the spasmodic contractions, which are very characteristic. Some shiverers show decided symptoms when taken to a water trough, or when offered a pail of water on the ground. As soon as they extend the neck, the hind quarters are seized with a spasm, and whilst the fore feet remain implanted on the ground, the body is thrown backward, the back arched, and the tail and quarter muscles convulsively shiver. I have seen bad shiverers that would face a water-trough without a sign. . . . Aggravation of symptoms may accompany an attack of strangles

or influenza. Some of these cases present such acute symptoms of cerebro-spinal disease as to cause the greatest alarm. There is great constitutional disturbance, shown by pulse and respirations being doubled in frequency. Partial paralysis of the hind extremities is seen. Muscles of neck, back and quarters are rigid. Movement either backwards or forwards is almost impossible, and the countenance expresses fear and pain combined. As a rule, the symptoms gradually subside, and the horse resumes work with no inability save that shown when backed."

In a few cases, the spasms appear in the fore limbs. Sometimes, bad shiverers are subject to more or less severe paroxysms of spasms, which may be complicated with distressed breathing, and high temperature, and which pass off after a time, only to return on future occasions.

Paralysis, as in kumree (p. 543), is not a symptom of shivering.

COURSE AND GRAVITY.—In almost all cases, shivering runs a chronic course, is incurable, and gets worse with age. Hence, it is an extremely grave unsoundness. Some bad shiverers work fairly well between the shafts, but, as a rule, it is best to use them in the plough, or as leaders, so as to avoid, as far as practicable, straining them by backing and turning them.

PREDISPOSITION AND CAUSES.—Hereditary predisposition is undoubtedly a strong factor in the production of this disease. It is not uncommon among the cart horse and vanner type of animal, but it very rarely attacks ponies or well-bred horses. Town work seems to predispose horses to it, more than agricultural labour. Geldings are usually considered to be more susceptible to it than mares; the reason probably being that there are more of the former than of the latter in cities. As a rule, it affects only horses which have been put to work, although cases of it have been met with in young, unbroken animals. It is said to be more common in Scotland than elsewhere.

No exact information has been obtained respecting the cause of shivering. Excitement and injury hasten its development, but they cannot be regarded as producers of shivering, because their effect in that direction is practically inert on well-bred horses. As the raising of the feet in shoeing will cause a shiverer much distress, its remembrance will generally bring on a more or less severe paroxysm when he is again taken to be shod. In susceptible horses, the symptoms are often seen for the first time after a railway journey. Some persons regard casting (as, for instance, for castration) and docking as causes of shivering, but no proof has been advanced in support of either of these suppositions.

THE EXAMINATION OF A SHIVERER for soundness is not always an easy task to perform with accuracy, because the symptoms are often intermittent. It should naturally be conducted with greater care, in the case of a heavy horse, than in that of a light one. It is advisable to adopt the following procedure:

1. See the horse in his stall or box, and observe if he "cocks" his tail or leg. Make him move over to one side, and then to the other.

2. Sharply back him and turn him to both sides, and note how he lifts his legs.

3. Take up each of his legs, one after the other, hold them up for a few seconds, and see that there is no unusual difficulty in raising them, and that he does not shiver.

4. Offer him water to drink, and observe if he "cocks" his tail or leg.

Immobilité

is a more or less chronic condition brought on by various kinds of brain disease, of which water on the brain is the most common. It is characterised by mental torpidity and failure to correctly coordinate external impressions.

I venture to think that immobolité is extremely rare in England, where it is often erroneously supposed to be identical with "shivering." According to Friedberger, Fröhner, Cadéac, and others, it is frequent on the Continent. Mancuer, quoted by Cadiot and Ries, states that it "rages like a true enzootic in certain parts of the Alps, and of the Valley of the Rhone; attacking in preference brood mares and young horses of from six months to three years of age, but seldom mules. There are certain stricken farms on which horse breeding cannot be carried on, as all the young horses become attacked with immobilité by the time they are one or two years old. In districts where this disease is common, human beings are equally subject to brain affections."

The SYMPTOMS are those of pressure on the brain, which consequently suffers from partial absorption. There is more or less loss of consciousness, feeling, and power of volition. The pulse and respiration are slow, and there is an entire absence of fever. The animal often shows a tendency to go round in a circle, and during movement to raise his feet very high, as if he were passing through a stream of water or crossing an obstacle (Friedberger and Fröhner). He pays little or no heed to sights, sounds, or blows. He eats his food in an irregular manner, fast, slow, or at intervals, and frequently holds a portion of grass or hay in his mouth for

a considerable time without moving his jaws. If the animal's legs be placed in a constrained position, he will maintain it, although it would be extremely irksome to him were he in health. "A sign which is very characteristic, is dragging the fore legs on the ground when the horse is made to rein back. This is not done by animals which make a difficulty in reining back on account of want of training, or pain in the loins" (*Trasbot*). The expression and actions are those of stupidity and insensibility to external impressions. Sometimes the disease assumes an acutely inflammatory course, which is accompanied by symptoms of excitement and delirium.

TREATMENT, which may consist of strong purgatives (aloes or Epsom salts) and iodide of potassium, is rarely of any use.

Paralysis of the Face.

The nerves (the seventh pair) which, on each side of the head, supply the muscles of the lips, nostrils, cheeks, eyelids, and ears with power of movement, on leaving the brain, issue respectively through the canal of the internal ear, and gain the outside of the cheek just below the point of the jaw (Fig. 115, p. 299). They pass, one on each side, along the cheek, close under the skin, to the lips; giving off, during this course, branches to their various muscles.

SYMPTOMS.—Drooping of the eyelid, inability to fully close the eye, powerlessness to erect the ear, and difficulty of breathing, owing to impairment of the respiratory organs in the throat or chest, are signs of the injury to the nerve being more deeply placed than its point of passage below the joint of the jaw. These nerves communicate with nerves (the tenth pair) which largely influence the action of breathing and of the heart. Difficulty of breathing may be also caused, especially during work, by falling in of the nostrils, owing to the muscles which dilate their opening, being paralysed. If the muscles only of the lips, nostrils and cheek be implicated, we may conclude that the seat of injury is on the superficial course of the nerve. As they are motor nerves (their action being to stimulate muscular contraction); arrest of their function through injury, will be followed by a continued flaccid condition of the muscles which they supply. The paralysis may be on one side or on both. When the nerve on one side only is affected, the lip will be drawn away from that side, owing to the paralysed muscles not being able to oppose the action of those of the healthy side. If both

nerves be implicated (Fig. 151), the lips will hang loose and motionless; and saliva will continually trickle from the lower one. As the sufferer has lost the power of prehension with his lips, he will seize his food with his teeth, and will bury his mouth in the water he wishes to drink. We may here note that the horse performs the act of drinking by using his mouth as a suction pump; the diminution in the pressure of the air contained in the mouth being made by drawing back the tongue. Hence, in order for this pump to act properly, the lips must be firmly closed

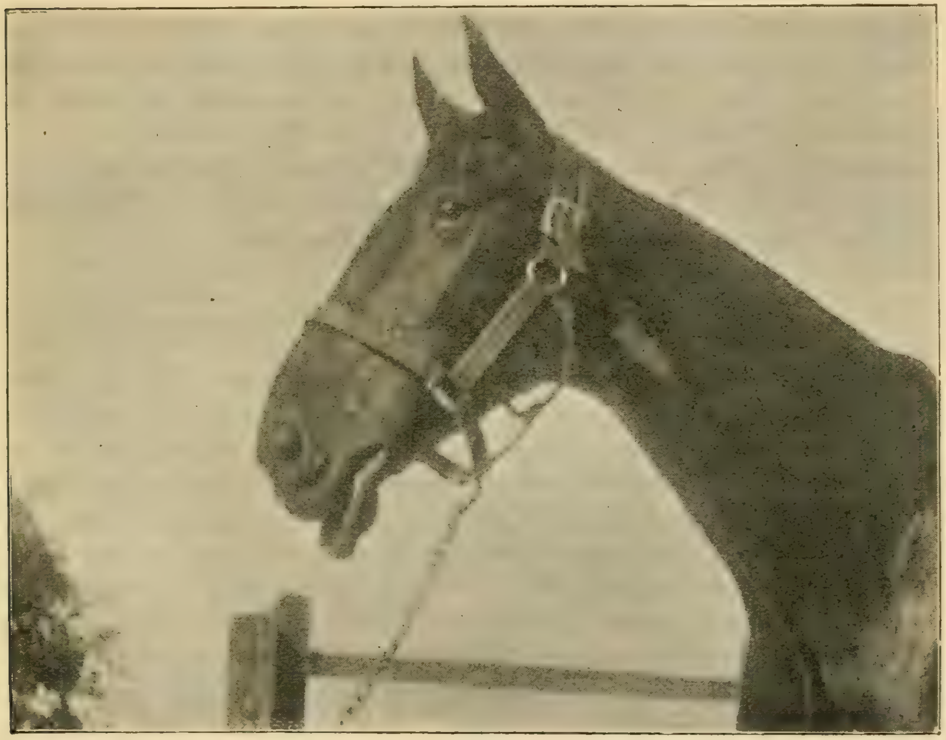


Fig. 151.—Paralysis of lips on both sides.

together above their point of immersion in the fluid. When paralysis of the lips exists, the animal is obliged to bury his muzzle above the corners of his lips in the fluid, so that fluid, not air, may enter his mouth.

CAUSES.—As the course of these nerves, from ear to lips, lies almost immediately underneath the skin, they are particularly liable to external injury from blows, use of heavy and ill-fitting bridles, pressure on the head while the animal is held on the ground during operations, and similar causes. In their deeper portions they may suffer from pressure caused by tumours, en-

larged glands, inflammatory exudations, or extravasated blood. Consequently, this paralysis sometimes follows influenza and other diseases. A fall or severe blow on the head might damage their point of origin in the brain.

CHANCES OF RECOVERY.—The hopeful cases are those of recent standing and when the paralysis is confined to the lips and nostrils.

TREATMENT consists in removal of pressure from the part; warm fomentations; and, subsequently, biniodide of mercury blisters (p. 620) below the root of the ear, and, partly, down the cheek; a dose of aloes; and soft and laxative food, placed in a bucket, so that the animal may easily eat it. Half an ounce of iodide of potassium may be given daily in the drinking water, or in a mash. The action of this salt is to cause absorption of any exudation which may result from inflammation, and which may be the cause of pressure on the nerves of the part.

Megrims, Staggers, and Epilepsy.

The affection called in stable language, megrims, or staggers, somewhat resembles apoplexy in its mode of invasion, and may be due to many causes, among which, pressure of the collar, in giving rise to congestion of the brain, appears to be the chief. "There is the certainty that animals which have been subject to attacks of megrims when working in the ordinary collars have enjoyed perfect immunity from such seizures, when worked with a strap or band across the breast. This is a fact recognised not in this country only, but wherever horses are employed for draught" (*Robertson*). In the large majority of cases, it occurs only when the horse is at work in draught. In some rare instances, the attack is due to brain disease, and will then, more or less, resemble epilepsy, which comes on, at fairly regular intervals of time, with little or no warning, and is accompanied by convulsions and loss of consciousness. The term megrims, in human medicine, signifies a form of headache which appears in paroxysms.

SYMPTOMS.—The attack commences suddenly. The horse throws his head about; stops, if previously in movement; staggers, and even falls. There is marked fulness of blood in the head; quickened breathing; and, often, loss of consciousness and convulsions.

The TREATMENT is self-suggestive—if the seizure be brought on by the pressure of the collar—to remove the offending gear;

and to "cool" the animal down with laxative food, and a mild dose of physic, if necessary. The case hardly admits of treatment, if the complaint be due to nervous disease; for, in the horse, we require at least, "practical soundness," and not mere prolongation of life, as might be sufficient in human practice. Even for stud purposes, an animal afflicted with brain disease, would scarcely be worth keeping; considering the marked influence of heredity in this complaint.

Sunstroke.

DEFINITION.—A state of sudden unconsciousness and paralysis brought on by exposure to great atmospheric heat, generally intensified by muscular exertion.

NATURE OF THE DISEASE.—In human medicine, there are three forms of sunstroke recognised: (1) Heat exhaustion, causing failure of the action of the heart. (2) Heat shock, *coup de soleil*, or sunstroke proper, in which, exposure to great heat, often aided by intense glare, appears to paralyse the nerve centres of breathing and of blood circulation by sudden shock, so that the lungs and heart are unable to perform their functions. (3) Heat fever or heat apoplexy, in which the nerve centres become exhausted from over-stimulation due to prolonged exposure to heat. We have good reason to believe that the temperature of the body is regulated by a heat centre in the nervous system. As nerves become insensible to a stimulus by which they have been highly excited for a long period; we may account for the sudden rise in temperature and consequent climax in cases of heat apoplexy, by supposing that great and continued heat had so over-stimulated the heat centre, that it had at last lost its power of control, with the result that the temperature rises to such an extent as to arrest the action of the lungs and heart, to a greater or less extent. I believe every one of the scores of cases of sunstroke which I have seen among horses in hot climates, came under the heading of heat apoplexy.

SYMPTOMS.—The history is, generally, somewhat as follows: The horse, who, in many cases, had been previously dull and breathing quickly (with, of course, distended nostrils), is taken out to work, which he does fairly well (although an experienced person would observe that he was much more distressed than he ought to have been), until, more or less suddenly, he totters; his legs give way under him; and he falls down in an insensible condition. He may then struggle convulsively, get up and throw himself down in a most dangerous manner; or, while lying on the ground, he may make frantic efforts to get up, which he is unable to do owing to his being paralysed behind, and will madly dash his head on the ground. In these convulsive efforts, he often inflicts terrible injuries on himself. Paralysis of the hind quarters is a well marked symptom of sunstoke in the horse. Others will remain lying down, as if dead: these are the hopeful cases. In all such instances,

the animal is unconscious of external impressions, which fact will serve to distinguish this disease from hæmoglobinuria (p. 520). The temperature is high. The eyes are staring, but they evidently do not see, because their surface can be touched by the finger with little or no wincing, on the part of the patient, from the contact. Apparently, head symptoms predominate. The breathing is shallow and greatly quickened, and in bad cases the pulse is so frequent and weak that it is all but imperceptible. The skin may be dry, or partially covered with perspiration. In severe cases, the muscles over the whole surface of the body will often be in a state of continued tremor. If the disease is going to run a fatal course, it will usually do so within about six hours. Some horses apparently get all right after an attack of sunstroke, but begin to "blow" again in a few hours, in which case they generally die from congestion of the lungs. When a horse which has fallen down from sunstroke gets up, we may regard him as convalescent. Horses that drop from sunstroke do so, as a rule, after 2 or 3 o'clock in the afternoon.

CAUSES.—Although I have seen heat apoplexy during very hot weather, affect horses travelling by rail in open trucks, and others which were kept in ill-ventilated stalls; such cases were so few in number compared to those struck down during work, that I must regard fatigue as a marked accessory cause. I have never known a horse get sunstroke, in the first instance, from standing in the open, no matter how hot the weather may have been, provided that he had the advantage of shade which, like that of a tree with good foliage overhead, did not interfere with the circulation of air. The Tramway Company of Calcutta (in which city cases of equine sunstroke are very common in the summer), by reducing during the hot months the length of their stages to distances of $1\frac{1}{4}$ or $1\frac{1}{2}$ mile, almost entirely stopped among their horses the occurrence of sunstroke, which, with longer stages, had previously been frequent; although they did not alter the length of the daily average journey of $12\frac{1}{2}$ miles. The danger of sunstroke from work, either in saddle or harness, during hot weather, is greatly increased by keeping the animal exposed to the direct rays of the sun some time before starting. The history of many cases of sunstroke which I have seen, suggests the conclusion that the effect which the direct rays of the sun, when very hot, have on the skin, is, at first, that of checking, instead of stimulating, the excretion of perspiration, so that the animal in place of being cooled down by copious evaporation from the skin, feels as does a man who is in the hot stage of an attack of intermittent fever. But, as I have often found when riding and driving long distances

during mid-summer in India, if we apportion the work of, say, the first hour, so that the horse's skin recovers its normal function, acts freely and then is allowed to dry while the animal is kept at an easy pace, he will after that, if in "condition," be able to go at least three times the distance he could have done, had he been given no preliminary preparation.

Deprivation of water is a strong predisposing cause of sunstroke, in that it cuts off the supply of the fluid by the evaporation of which, in the form of perspiration, the body is kept cool. Among other predisposing causes, we have: residence in a stable which is ill-ventilated, crowded, or which does not afford adequate protection against the direct rays of the sun; too much corn; and an insufficiency of green food.

CLIMATE.—The climate most favourable to the development of sunstroke, is a very hot one which, like that of Calcutta, has a sufficiency of moisture in it to check the cooling influence, on the body, of the evaporation of perspiration. The glare of the sun off buildings and roads appears to help in bringing on an attack.

BREED AND TEMPERAMENT.—The horses most predisposed to sunstroke are naturally those which have been bred in a temperate or cold climate, especially if they have little or no Eastern or thoroughbred blood in their veins. From my own observations I believe that the internal temperature of Indian Country Breds is, as a rule, lower than coarse-bred horses, whose skin and hair are thicker and their sweat-glands less active than those of Indian Country Breds, Arabs, and thoroughbreds. Consequently they cannot keep themselves so cool, as better bred horses. I have observed that horses which perspire little, are specially liable to sunstroke. Excitable, hard-pulling horses will naturally be more apt to suffer from heat exhaustion than more placid-tempered animals.

PREVENTIVE MEASURES.—The predisposing causes should be guarded against. Before taking a horse out to work, in a climate and during weather in which sunstroke is liable to occur, his breathing and general state should be observed. If he be seen to "blow," he should be put back, and should be treated as the case may demand. On a journey, under similar conditions, any unusually quickened breathing and unwonted depression should at once be attended to. In such instances the clinical thermometer (p. 681) will be very useful. A rise of say 5° F. will point to the existence of serious danger. Horses which have to work

in the sun, like those on tramways, should have short stages, and should be watered immediately after doing their turn. Probably the best mechanical protection for animals at work in the sun is a thick shade (of wood or stout leather, for instance) for the eyes and forehead. There is no doubt that the effect of intense glare on the retinæ of the eyes is a potent aid in bringing on an attack of sunstroke. In our own cases, we may experience the great relief and actually cooling effect of blue, green, or neutral-tinted glasses when worn in the open on a very hot and sunshiny day. The retina, which is an expansion of the optic nerve and which is close to the brain, is peculiarly sensitive to heat rays as well as light rays. Also, the brain is nearer the surface at the forehead, than at any other part of the head. Pith sun-protectors placed over the top of the head and poll, and over the loins, as is often done in India, are of little value in guarding against sunstroke, as compared to that of thick shades for the eyes and forehead. The sun-bonnets used during summer on horses in England, give no protection against sunstroke; for they do not shade the eyes and forehead, and are far too thin. Everyone who has travelled, knows that a straw hat is not of the slightest use for shielding the head against the rays of the sun in the tropics, for which object a thick head covering of a material that is a bad conductor of heat (such as a turban or pith helmet) is indispensable. When horses, by the fact of their "blowing" without having been worked, and being out of spirits without cause, are seen to bear hot weather badly, special precautions should be taken with them. It will be found that such animals will generally have an unusually hot skin, and will perspire with difficulty; in fact, they will be feverish. They should have a plentiful supply of salt (p. 593) and may, from time to time, get an ounce of bicarbonate of soda (baking soda) in their water every day for a week or ten days. Their supply of drinking water should of course be unlimited.

TREATMENT.—In cases of threatened sunstroke, as would be made manifest by quickened respiration and marked rise of temperature, say, over 103° F., I would advise that the animal should get 1 lb. of Epsom salts in a couple of quarts of water; and after that, 1½ drachm of phenacetine every four hours (according as control over the temperature is obtained), or 1½ drachm of tartar emetic in his drinking water for a few days. He should have a constant supply of water to drink, and his food should be restricted to "green meat" (grass, lucerne, etc.), carrots and other suitable roots. If this scale of diet cannot be carried out in its entirety, he should have bran mashes or boiled barley, in strictly moderate quantities,

instead of corn given in the usual way. All food which contains a large proportion of nitrogen, such as pease and gram, should be withheld.

When a horse is "knocked down" by sunstroke, the best treatment is the application of cold to the surface of his body, especially to his head and spine. Writing in the "Veterinary Record," 2nd March, 1901, Major D. C. Pallin describes the very successful results (with losses of only about one per cent.) obtained by this method in America. He tells us that in a case he saw, the animal "lay comatose and motionless on a bed of matting. Lumps of ice had already been applied to the head and neck, crushed ice being pushed into both ears, while two hose pipes of icy cold water, played with great force along the spine, on the body and extremities. . . In a short time he was on his legs and staggered into a comfortable box, where whisping and drying were had recourse to, and I was informed that the patient would be sent home on the following day." In these cases, no medicine is given. When we cannot apply cold in this admirable manner, we should do the best we can by cold water and fanning.

CHAPTER XXV.

Poisoning in Horses.

In writing this chapter I have consulted chiefly: Murrell's "What to do in Cases of Poisoning," Finlay Dun's "Veterinary Medicines," and Whitla's "Dictionary of Treatment."

Only the most usual poisons which are given to the horse, maliciously or by misadventure, will be considered.

In all cases, no time should be lost in applying the available remedies; for, here, time is all important.

Acids, Mineral.

Under this heading are included those extremely corrosive poisons, nitric acid, sulphuric acid, and hydrochloric acid.

SYMPTOMS.—Great abdominal pain; mucous membrane of mouth inflamed and swollen, and probably stained by yellow, brown, or black patches. In cases of poisoning by nitric or hydrochloric acid, the breath may have the characteristic odour of the particular acid. Great depression; pulse small, rapid, and in bad cases irregular; violent thirst with great difficulty (or total inability) in swallowing. There is often difficulty in breathing. The patient may die quickly, or may succumb after several days or weeks from ulceration or perforation of the stomach or intestines.

TREATMENT.—Give large draughts of soap (say, a couple of pounds of yellow or unmedicated toilet) and water; a solution of baking soda (say 2 lbs.) and a gallon of water; fluid magnesia, of which a quart or more may be given; chalk and water; washing soda (which is not as suitable as baking soda); plaster scraped off walls and mixed with water; linseed, olive or other sweet oil (say two or three quarts); 5 lbs. or 6 lbs. of butter or, in India,

ghi; milk; gruel; or even large quantities of plain water. Perform tracheotomy if necessary.

About 5 grains of morphine hydrochlorate, dissolved in water may be injected hypodermically, to allay the pain and to ward off the effects of shock.

Aconite.

Gresswell, in "Diseases and Disorders of the Horse," states that "many quack nostrums and some formulæ in the possession of stablemen and others contain overdoses of tincture of aconite," which, consequently, is a common cause of poisoning. We should remember that Fleming's tincture is six times as strong as that of the British Pharmacopœia. Finlay Dun cites the case of an old cab horse, which it was intended to destroy, getting two drachms and a third of Fleming's tincture, and recovering, although he very nearly died. The usual dose is 7 or 8 drops.

SYMPTOMS.—Marked nausea, with attempts at vomiting; discharge of froth from the mouth, and sometimes sounds of gurgling in the throat; pulse very weak and irregular; breathing shallow and slow; great depression; body usually covered with perspiration.

TREATMENT.—Give large doses of spirits and water. Hand-rub the animal all over, so as to stimulate the circulation. Give a hypodermic injection of 40 minims of liquor atropinæ sulphatis, which may be repeated.

Aloes.

Probably more horses are killed by the injudicious administration of aloes than by any other drug.

SYMPTOMS are those of superpurgation, with great weakness, depression, abdominal pain, and flatulence.

TREATMENT will be the same as for superpurgation (p. 425).

Ammonia.

Liniments containing ammonia are sometimes given by mistake as a draught to a horse. Hertwig found that one ounce of strong liquor ammoniæ, which is three times as potent as the ordinary liquor ammoniæ, caused death to the horse.

SYMPTOMS.—Great pain; inflammation of the mucous membrane of the mouth; extreme difficulty in breathing; choking cough; slow pulse.

We may detect the smell of ammonia from the breath. If a glass rod which has been dipped in hydrochloric acid be held near the horse's nostrils, white fumes will be given off.

TREATMENT.—Give half a pint of vinegar in a quart of water. This may be repeated if required. If vinegar be not at hand, substitute lemon or lime juice, or give double or treble the amount of orange juice. If the animal cannot swallow, make him inhale acetic acid (for preference) or vinegar from a handkerchief or sponge. Tracheotomy should be performed if the difficulty of breathing demands it. Inject hypodermically (p. 633) 5 grains of morphine hydrochlorate dissolved in water.

Arsenic.

Poisonous doses of arsenic are often given to horses maliciously, and also by ignorant persons to improve the condition of the animals, in which case the poisoning may be either acute or chronic.

Horses have taken 3 drachms of arsenic in bulk, without harm resulting to them. Half that amount given in solution on an empty stomach would probably kill.

SYMPTOMS OF ACUTE ARSENICAL POISONING.—Great abdominal pain; depression; pulse rapid, small, and irregular; breathing hurried and painful. Diarrhœa is frequently present.

SYMPTOMS OF CHRONIC ARSENICAL POISONING.—The eyelids are puffy, and the eyes irritable and watery. The animal is depressed and breathless, if put to fast work which would not inconvenience him were he in his usual state of health. There is sometimes a scaly eruption of the skin.

TREATMENT OF ACUTE CASES.—Give a pint or more of a solution of dialysed iron (which can be got at any chemist's shop) mixed with a quart of water, and repeat; or give half a pound of freshly-prepared sesqui-oxide of iron mixed in warm water; or magnesia in unlimited quantities. If these be not at hand, give castor oil, linseed, or any other sweet oil, butter, or, in India, ghi, frequently and in large quantities. If the weakness be great, give spirits freely. After the acute symptoms have subsided, inject hypodermically (p. 633) 5 grains of morphine hydrochlorate, dissolved in water.

TREATMENT OF CHRONIC CASES.—Stop the arsenic, and attend to the animal's general health.

Bee Stings.

Remove the sting. Apply ammonia, a strong solution of washing soda, chloroform, carbolic oil, or a raw sliced onion. Give a liberal amount of spirits if the depression be great.

Belladonna.

Atropine is the active principle of belladonna.

A horse can take by the mouth an ounce of extract of belladonna, or 3 grains of atropine, without dying from it.

Cases of poisoning may arise from liniments being given inadvertently as drenches, or from overdoses.

SYMPTOMS.—Dilatation of the pupils; insensibility of the eyes to light; dryness of the mouth; excitement; nervousness; unsteady gait; and finally, sleep, and recovery or death.

TREATMENT.—Give two or three bottles of spirits diluted with water, or large quantities of strong coffee. Inject hypodermically a few times 5 grains of morphine hydrochlorate dissolved in water. If the urine is not freely voided, draw it off with a catheter.

Bhang.

This drug is frequently given in India to horses to render them quiet for the time, and also to improve their condition. It is composed of the leaves and capsules of the *cannabis indica*. It acts like opium and spirits in causing excitement, followed by stupor and insensibility, with dilatation of the pupils.

Give a full dose of aloes, say $\frac{3}{4}$ oz. Administer strong tea or coffee.

Cannabis Indica.

See "Bhang."

Cantharides.

Horses are poisoned sometimes by these blistering flies being given in excessive quantity, in condition or other powders or balls; or by too large a surface of the body being blistered by

them, in which case the active principle (cantharidin) is absorbed. A drachm and a half given by the mouth would probably cause death.

SYMPTOMS are those of inflammation of the stomach and intestines; flow of saliva from the mouth; intense irritation of the urinary organs; and continued attempts to urinate, but little passed, and that mixed with albumin, the presence of which is characteristic of the poison. The urine may also be mixed with blood. There is high temperature, and convulsions.

TREATMENT.—Give large quantities of white of egg (raw) and water, gruel, barley water, or gum and water. No oil should be administered; for it would dissolve and distribute the cantharides. Two or three ounces of laudanum may be given to soothe the pain.

Carbolic Acid.

A poisonous dose would probably be about 3 or 4 oz.

SYMPTOMS.—Intoxication; mucous membrane of mouth white and hardened; pupils contracted; urine very dark; shallow and difficult breathing; pulse small, frequent, and in bad cases irregular; great weakness; and insensibility.

TREATMENT.—Give 2 lbs. of Epsom or Glauber salts dissolved in a couple of quarts of water, and repeat if necessary. These salts form harmless sulpho-carbolates. In default of these, give large quantities of white of egg (raw) in water, or any sweet oil. Administer full doses of spirits and water to keep up the strength.

Caustic, Lunar,

may be swallowed by accident when the mouth is being cauterised. Give 4 oz. of common salt dissolved in water at short and repeated intervals.

Chloral Hydrate.

Death arises from paralysis of the heart.

Give strong tea or coffee; hand-rub the body vigorously; and try to rouse the patient by slapping and speaking to him.

Chloroform.

Overdoses usually occur when preparing a horse for an operation. The dangerous symptom is stoppage of breathing. As long as the breathing is all right, there is practically no danger.

TREATMENT.—Draw the tongue out. Give the animal plenty of air. Dash cold water (and, if procurable, warm water alternately) in his face. Keep his head low. Try to set up artificial respiration by turning the animal alternately on his back and side, at intervals of about 5 or 6 seconds. Give him (so as to act agreeably to the advice, in human practice, of Murrell) two or three sharp cuts with a whip or cane across the chest, in order to restore the action of the heart.

Colchicum Autumnale (*Autumn Crocus, or Meadow Saffron*).

There have been several cases reported of horses dying from eating in their hay the stalks, leaves, and seeds of colchicum. The symptoms were: violent diarrhœa, sometimes mixed with blood; severe colic and depression; frequent pulse; and hurried and difficult breathing. *Post-mortem* examination shows extensive congestion of the internal organs. The rate of mortality depends on the amount of poison consumed.

In human cases there is intense thirst, profuse perspiration, and persistent purging, the stools being mixed with blood; in fact, the symptoms are somewhat similar to those of Asiatic cholera. The advisability of digging up these plants on pasture lands and destroying or removing them, is self-evident.

Give frequent ounce doses of tannic or gallic acid, or large draughts of strong boiled tea. Give spirits and water if the depression becomes alarming. Inject hypodermically (p. 633) 5 grains of morphine hydrochlorate dissolved in water.

Copper.

The salts of copper in most common use are bluestone (the sulphate) and verdigris (the subacetate). About 3 oz. of either of these would kill a horse.

SYMPTOMS.—Colic; diarrhœa, mixed with blood; great depression; hurried and difficult breathing; and convulsions followed by death.

Chronic poisoning occasionally occurs among animals depastured in the neighbourhood of copper-smelting works, but such effects are apt in part to depend upon the arsenic present in these ores. The prominent symptoms are impaired appetite, constipation, imperfect nutrition, muscular weakness, and occasionally bloody urine (Finlay Dun).

TREATMENT.—Large quantities of white of egg (raw) and water, milk, gruel, or arrowroot. Inject hypodermically (p. 633) 5 grains of morphine hydrochlorate dissolved in water, or give 6 oz. of laudanum in water as a drench.

Corrosive Sublimate (*Perchloride of Mercury*)

may be given by mistake for some other white powder. Its great weight is characteristic. About a drachm and a half is a poisonous dose for a horse.

SYMPTOMS.—Great pain; profuse purging; dung mixed with mucus and blood; skin cold and moist; breathing difficult. The intelligence remains unimpaired up to the last. Death results from failure of the heart.

TREATMENT.—Unlimited amount of white of egg, which forms an insoluble albuminate; or gruel made with flour, arrowroot, or oatmeal. Give spirits and water if depression be extreme.

Creosote.

See "Carbolic Acid."

Croton.

The oil or seeds are sometimes ignorantly given to the horse as a purgative. Twenty drops of the oil, or a similar number of the seeds, would probably kill a horse.

The symptoms are those of violent purgation and inflammation of the stomach and intestines.

Give large draughts of soothing drink, such as gruel, white of egg and water, and arrowroot; half an ounce of spirits of camphor, which may be repeated four or five times; spirits and water; or 6 oz. of laudanum.

Indian Hemp.

See "Bhang."

Lead.

The poisonous salts of lead in ordinary use are sugar of lead (the acetate), white lead (the carbonate), and the subacetate employed in making lotions. Acute lead poisoning is very rare in the horse; although the chronic form is not unfrequent. The difference between the two depends on the amount and frequency of the dose of poison taken. Young animals are far more easily affected by any of the poisonous (soluble in water) salts of lead than older ones. Cases of this form of poisoning may arise from eating grass which has been grown under the influence of the fumes given off by neighbouring lead-smelting works, or which has been manured with slag obtained from these furnaces; from drinking water contaminated by lead pipes, lead cisterns, carbonate of lead (in putty, for instance), white lead paint, or other compounds of lead; or from eating lead—*e.g.*, bullet spray, scattered over grass near rifle butts. Although the causes which render some kinds of water more liable than other kinds to dissolve metallic lead, are not very accurately known, the fact remains that the presence of decomposing vegetable matter in water greatly increases its power of dissolving that metal, in which process, bacteria may assist by forming an acid that makes a soluble compound with lead.

SYMPTOMS OF ACUTE LEAD POISONING.—Colic; constipation, or bad-smelling diarrhœa; cramps; depression; delirium; convulsions; and paralysis.

PRINCIPLES OF TREATMENT.—(1) Stop (especially in acute cases) the action of the poison, which is necessarily in a soluble form, by converting it into an insoluble compound. We can do this by the administration of sulphuric acid, Epsom salts or Glauber salts; the result being the greater or less formation of the insoluble sulphate of lead. (2) Relieve, if present, the constipation, which may also be effected by giving Epsom salts or Glauber salts. It is evident that a laxative state of the bowels favours the removal of the poison from the system. (3) Eliminate the lead which may have become deposited in the tissues. For this end, iodide of potassium is particularly useful. (4) Combat the paralysis, which may be done by strychnine and massage. (5) Allay pain, if present, by chloral hydrate or chlorodyne.

SYMPTOMS OF CHRONIC LEAD POISONING.—Paralysis of the limbs; cough; difficulty in breathing; roaring; swelling of the knees and fetlocks; hidebound; emaciation; and impaired appetite and digestion. There is no fever. In human beings suffering from chronic lead poisoning, a blue or grey line (caused by the presence of sulphide of lead) along the edge of the gums may

be noticed, but this is not seen in horses. "In young growing animals, all the bones of the body suffer more or less enlargement, so much so that the face loses its angular outline, and the limbs become swollen and deformed" (*Axe*). The roaring is due to paralysis of the muscles which open the larynx (p. 381).

TREATMENT OF ACUTE POISONING.—Give 1½ oz. dilute sulphuric acid in 3 pints of water; 1 lb. of Epsom or Glauber salts, which may be given with the acid, or separately, and repeat if necessary. If these drugs cannot be obtained, give white of egg (raw) and water; or milk. To allay pain, inject hypodermically (p. 633) 5 grains of morphine hydrochlorate dissolved in water, or give 1 oz. chloral hydrate in a pint of water.

TREATMENT OF CHRONIC LEAD POISONING.—At once remove the animal from the cause of the poisoning; give dilute sulphuric acid, Epsom or Glauber salts, as advised in acute cases, twice a day for four or five days. After that give ½ oz. iodide of potassium (to eliminate the lead from the system) twice a day for a fortnight or three weeks. Any swelling on the limbs might be painted with liniment of iodine. The paralysed muscles should be well hand-rubbed three times a day. Inject 25 minims of a solution of hydrochlorate of strychnine (1 to 100) into the paralysed muscles twice a day. Feed the animal liberally.

Liquorice, Indian.

The seeds of this plant (*Abrus precatorius*) are employed throughout India as a weight (*rutti*, which is about 3 grains) both by native jewellers and druggists. "In India they are used illegitimately for killing cattle, especially by the chumar or skinner caste. The seeds are powdered, moistened with water, and then rolled into little pointed cylinders or needles, called *suis*. The *sui*, or *sutari*, as it is sometimes called from its resemblance to a cobbler's awl, is dried and fixed into a wooden handle. The animal is stabbed with one of these instruments, the point being left, and dies within a few hours" *(Murrell)*. The activity of the abrus depends on a ferment. It does not contain an alkaloid. I have heard of several cases of horses being poisoned in this manner; but I have never seen one, nor have I ever read a description of the symptoms. As to treatment, Murrell suggests the free administration of stimulants (whisky or brandy).

Lunar Caustic.

See "Caustic, Lunar."

Meadow Saffron.

See "Colchicum."

Morphia.

See "Opium."

Nux Vomica.

The active principle of nux vomica is strychnine, both of which have at times been given maliciously to horses by criminally-disposed persons. About 15 grains of strychnine would kill a horse.

SYMPTOMS.—Violent and continued spasms, which cause death by stopping the breathing.

TREATMENT.—Give 2 oz. of chloral hydrate dissolved in a pint of water, as a drench; or $\frac{1}{4}$ oz. of it dissolved in 2 oz. of water, as an intra-tracheal injection (p. 635), or make the animal inhale chloroform. If these drugs cannot be obtained, give large doses of spirits (a couple of quarts of whisky or brandy) and water.

Opium.

It takes as a rule about $2\frac{1}{2}$ oz. of opium, or 100 grains of acetate of morphia, to kill a horse.

SYMPTOMS.—Sleepiness; stupor; staggering gait; relaxation of the muscles; slow breathing; weak, soft, and slow pulse; delirium; unconsciousness; convulsions; and death. In horses the pupils are often dilated. There is always a previous period of excitement, which, in the case of poisonous doses, is very short. The smell of opium may be detected in the breath.

TREATMENT.—Do everything to rouse the animal. Give large draughts of strong coffee or tea. If he cannot take them, give them as an enema. Inject subcutaneously (p. 633), 2 grains of sulphate of atropine, dissolved in water, and repeat if necessary. Make him inhale nitrite of amyl. Try to set up artificial breathing (p. 581).

Phenol.

See "Carbolic Acid."

Snake Bite.

SYMPTOMS.—Shock; swelling of the part; faintness; paralysis; unconsciousness; convulsions; death.

TREATMENT.—In his book, "Diseases of the Horse," Mr. Hutcheon, M.R.C.V.S., makes the following remarks on snake-bite:—

"I have had very little experience of the treatment of snake-bite in animals, but in the early part of 1892, I had an opportunity of trying the treatment of snake-bite by strychnine, discovered and successfully used by Dr. A. Mueller, of Tachandandah, Victoria, Australia. The Doctor writes—*vide Agricultural Journal*, March 24th, 1892—as follows:—'(*a*) I am using a solution of nitrate of strychnine of 1 in 240 of water with a little glycerine. (*b*) 20 minims of this are injected in the usual manner by a hypodermic injection. (*c*) The frequency of repetition depends on the symptoms being more or less threatening, say from ten to twenty minutes. When all have disappeared and the strychnine shows its first independent action by slight muscular spasms, the injections must, as a matter of course, be discontinued, unless after a while the poison again reasserts itself. The quantity of strychnine required in some cases has amounted to a grain or more within a few hours. Both poisons are thoroughly antagonistic, and no hesitation need be felt in pushing on the use of the drug to quantities that would be fatal in the absence of snake-poison. Out of about 100 cases treated after my method, some of them at the point of death, there has been but one failure, and this arose from the injections being discontinued after 1¼ grains had been injected. (*d*) Any part of the body will of course do for the injection, though I am in the habit of making them in the neighbourhood of the bitten part, or on it.'

"The case which I refer to was a horse which was bitten on the muscular portion of the right cheek, the whole of that side of his face and lips were intensely swollen and the swelling very soon extended to the throat, seriously affecting his breathing. I had no solution of strychnine and was, therefore, unable to inject it under the skin, but I administered doses of six grains of strychnine by the mouth, simply placing it well back on his tongue; the nervous prostration and the local swelling made it impossible to pour anything down his throat. I repeated the six grains of strychnine at intervals of half an hour, until I had given him sixty grains, after which slight muscular twitchings appeared and he gradually recovered. In addition to the administration of the strychnine, I cut an incision in the large cheek muscle, and locally injected a solution of carbonate of ammonia in spirit, being the only thing that I had. I am decidedly of opinion that the recovery was due to the strychnine. The dose is about five times as much as the horse would have

tolerated under any other circumstances. I can, therefore, recommend Dr. Mueller's treatment as being worthy of a trial."

If the bite has been inflicted on a limb, place a tight tourniquet on it between the wound and the heart, and try to prolong the period of admission of the poison into the blood by taking off the ligature for, say, a couple of seconds, and then instantly put it on again. Open out the wound with the knife, and freely cauterise with a red-hot iron or with some strong acid. If strychnine cannot be obtained, give large doses of spirits (brandy or whisky) and water.

South African Poisonous Plants.

Those of us who know South Africa, are aware that on the veldt there are many poisonous plants which Colonial-bred horses avoid, but which are readily eaten by imported animals. This most useful form of botanical knowledge has been one of the chief factors in making South African horses the best equine campaigners during the Boer war. Veterinary-Lieutenant A. J. Williams, A.V.D., has written in the "Veterinary Record," 11th Jan., 1902, a very interesting article on this subject. He tells us that tulip grass, or "tulp," is very common in many parts of South Africa, and that on one occasion, out of 44 English horses, which belonged to a battery, 16 died from eating it. The symptoms are those of extremely severe and violent, flatulent colic, and the best treatment is immediate puncture of the large intestine with a trocar and cannula, and Professor Dick's old colic drench, which is composed of 2 oz. of turpentine, 2 oz. of laudanum, and a pint of linseed oil. Mr. Williams also tells us that the eating of pepper bush or *sterkos*, which has a very hot taste, produces in horses severe diarrhœa and abdominal pain, to counteract which he advises an ounce of chlorodyne in a pint of linseed oil. The chlorodyne may be repeated in half-ounce doses in water, without the oil, which, in the first instance, is useful in removing the cause of the malady. Ink bush, which is a small green shrub, produces such severe inflammation of the stomach and intestines, when eaten, that the animal often dies in from six to twelve hours. Mr. Williams has not been able to find any cure for this form of poisoning.

Strychnine.

See "Nux Vomica."

Vetch Poisoning.

There have been many cases of poisoning by the eating of *Lathyrus sativus*, and the "dog-tooth" or Riga vetch. As the effects of the poison contained in these two seeds seem to be identical, I shall consider them under one heading. Owing to its cheapness, the *Lathyrus sativus* is imported in large quantities into England, where it is known as "Indian mutturs" or "Indian pease." Both of these terms are incorrect; for it is a vetch, not a pea; and the Hindustanee word "*muttur*," signifies, pea. In that language, this seed is known as *Kussaree dal.* It is a good deal smaller than an English pea, and is of a dark grey colour. Its continued consumption often causes a form of paralysis in man, not unlike that of kumree (p. 543) in horses. It is used as a food only by the poorest classes in India. In England, it is employed, either whole or as so-called "pea meal," almost entirely to adulterate horse and cattle food. Astier (see Watts's "Dictionary of the Economic Products of India") has shown that the poison in this vetch consists of a volatile liquid alkaloid which can be destroyed by heat. From observations I have made in India, concerning the effects of this seed on human beings, I have reason to believe that the heat evolved during ordinary cooking is not always sufficient to render this poison inert. McCall found that feeding horses on 1½ lbs. of boiled *Lathyrus sativus*, given daily with other food, produced no untoward symptoms, and consequently inferred "that boiling the peas destroys the poison, or at all events modifies the action of the active principle or poison contained in them." The effect of this poison appears to be cumulative and proportionate to its amount; other things being equal. Although in some cases no injurious result will be come developed in, say, three or four months, if the horse be given from 3 to 4 lbs. of this vetch daily. Absom mentions that "as a test case an old horse was given from 9 to 10 lbs. of the vetches every day for nearly five weeks, and he showed all the symptoms of poisoning at the end of that time." Although paralysis of the hind limbs (pp. 543 and 546) is not uncommon among horses in India; I have never observed it to be complicated by roaring; and am consequently convinced that such cases of paralysis are not due to vetch poisoning. This belief is still further strengthened by the fact that the *Lathyrus sativus* is rarely, if ever, used in India as a food for horses.

SYMPTOMS.—The symptoms, which generally come on suddenly, are essentially those of more or less pronounced paralysis, chiefly of the muscles of the limbs and of breathing. Beyond frequency of

pulse, the animal, while at rest, usually appears to be in fair health; but if exercised, he will be seen, by knuckling over and staggering, to have lost, more or less, control over his limbs; and will have great difficulty in breathing, and will roar. He may fall down in a convulsive fit, from which he will, as a rule, recover in two or three minutes; but these symptoms will reappear if he be again put to work. This difficulty of breathing is due to paralysis of one or both of the muscles which open the larynx (p. 380, *et seq.*). Fits of convulsive breathing may take place when the horse is at rest in his stall.

MORTALITY AND AFTER-EFFECTS.—The mortality varies from about 10 to 30 per cent. of those attacked. Almost all the horses which do not die from the immediate effects of the poison, have their powers of usefulness permanently impaired; often to such a degree as to incapacitate them from work.

POST-MORTEM APPEARANCES.—After death from an acute attack there will be found to be signs of death from suffocation, with congestion of the lungs, bronchial tubes, larynx, upper portion of windpipe, and spinal cord, and exudation of serum in the underlying tissues.

TREATMENT.—The only treatment which has shown up to the present a marked good result, is the insertion of a tracheotomy tube to save the patient from being suffocated during one of the fits of difficulty in breathing to which he is liable. Little or no benefit has been obtained from the administration of medicines. We might give a full ball of aloes, to be followed by a course of $\frac{1}{2}$ oz. of iodide of potassium for, say, a fortnight; should change the food containing the objectionable vetches; and should allow plenty of "green meat" and carrots.

Yew.

Although cases of death from eating yew, are not very uncommon; little is known about the nature or action of the poison. The male yew is considered to be much more dangerous to life than the female. I have no information to give respecting the amount required to cause death, or the rate of mortality. In fatal cases, death usually ensues in about four or five hours after eating the plant. In some instances, the symptoms more or less resemble those of flatulent colic; in others, death comes on very suddenly, as if from failure of the heart or lungs. For treatment, we might give 2 oz. of oil of turpentine in a pint of linseed oil, to be repeated once or twice.

CHAPTER XXVI.

Nursing.

THE SICK BOX—CLOTHING—FEEDING SICK HORSES—LAXATIVE FOOD—NOURISHING FOOD—WATER—SALT—GROOMING—EXERCISE.

THE SICK BOX.—If practicable, the horse should be placed by himself in a loose box, which should be comfortable, scrupulously clean, well bedded down, properly ventilated and free from draughts. As sick horses are seldom able to feed heartily, they should, as a rule, be kept in a warm atmosphere, in which the waste of tissue will be less than if the air were cold. Warmth being specially indicated in diseases of the chest and air-passages, great benefit will be obtained, in such cases, if the box is artificially heated by some means which will not vitiate the air. Warmth is also essential for the proper treatment of many ailments, in which, keeping the skin in healthy action is a necessary condition. Again, it is always better to have the horse warm by raising the temperature of the atmosphere of his box, than by clothing, which is apt to fatigue and annoy him. Means should be taken to prevent any heating apparatus employed, from rendering the air which the animal breathes, too dry.

Thorough ventilation should be obtained without creating any draughts. This is best done according to the principle advocated by Parkes, and exemplified by the plan of ventilating an ordinary room by raising the lower sash of the window a few inches, and closing up the open space below the bottom of the sash by a board. Ventilation will then be obtained between the two sashes without a draught, *i.e.*, without the existence of a direct current of air.

The foregoing remarks on ventilation have been made with special reference to temperate and cold climates. In tropical countries, a draughty position would often be preferable to a sheltered one.

Unless the horse requires to be tied up, or is in slings, he should be kept, as a rule, in a loose box, so that he may lie down, or move about as he chooses.

Saw-dust will often be better than straw as bedding in cases of lameness; for it accommodates itself more readily to the animal's movements. The same may be said of moss litter, or wood shavings.

CLOTHING.—If the proper conditions of warmth cannot be obtained by means of the temperature of the sick box, we should employ, for this purpose, clothing, which should be light as well as warm, and should be changed, beaten, brushed, and dried, as required. If the horse has an irritable skin, a cotton sheet should be used between it and the body-piece.

FEEDING SICK HORSES.—The appetite of these animals should be tempted by presenting them with daintily prepared food. Its nature should be judiciously varied and it should be given in small quantities and often. Any that remains should be removed and the manger cleaned, so that the patient may not become disgusted by having rejected, sour messes under his nose.

Food and drink should not be forced on a horse; for we should remember that the state of his appetite is the best guide by which we may know whether his system requires food or not.

LAXATIVE FOOD.—Under this general term, we may place a number of articles of diet which are useful in allaying inflammatory symptoms by inducing and keeping up a lax conditon of the bowels, and in promoting the excretion of waste material from the system. They also support the strength. The following list comprises the usual ones employed:—

Green Grass.	Turnips; especially swedes
,, wheat.	Gruel.
,, oats.	Bran mash.
,, barley.	Linseed and bran mash.
Lucerne.	Boiled barley.
Carrots.	Linseed tea.
Parsnips.	Hay tea.
Apples.	Linseed oil.

To the above, we may add, for use in India, sugar cane, bamboo leaves, boiled *moong*, boiled *urud*, boiled *kulthee* and *ghi*.

The employment of laxative food is specially indicated during the acute stages of inflammatory diseases, and in cases of injury.

Green grass, lucerne, and similar articles of fodder should be dried before being given, if cut when in a wet state.

Boiled grain should be cooked with a minimum of water, so that it may be comparatively dry, when it is taken off the fire Salt should always be given with it.

"One gallon of good gruel may be made from a pound of meal, which should be thrown into cold water, set on the fire and stirred till boiling, and afterwards permitted to simmer over a gentle fire, till the water is quite thick" (*John Stewart*).

To make a bran mash, scald a stable bucket, throw out the water, put in 3 lbs. of bran and 1 oz. of salt, add 2½ pints of boiling water, stir well up, cover over, and allow the mash to stand for fifteen or twenty minutes, until it is well cooked.

For a bran and linseed mash, we should boil slowly, for two or three hours, 1 lb. of linseed, so as to have about a couple of quarts of thick fluid, to which 2 lbs. of bran and 1 oz. of salt should be added. The whole should be stirred up, covered over and allowed to steam, as advised with a bran mash. The thicker the mash, the readier will the horse eat it.

Linseed tea is made by boiling 1 lb. of linseed in a couple of gallons of water until the grains are quite soft. It may be more economically done by using less water to cook the linseed, and afterwards making up the quantity of water to about a gallon and a half.

Hay tea is prepared by scalding a bucket, filling it with good sweet hay, pouring in as much boiling water as the bucket will hold, covering it over and allowing it to stand until cold, when the fluid may be strained off and given to the horse. This forms a refreshing drink.

Linseed oil, in quantities of from ¼ to ½ pint daily, may be mixed through the food. It keeps the bowels in a lax condition, has a good effect on the skin and air-passages, and is useful as an article of diet.

NOURISHING FOOD.—Under this heading I wish to include, more particularly, those foods which are specially valuable in supporting the strength, and which are consequently indicated during the period of convalescence. The chief ones are the various forms of "corn;" milk; eggs; bread and biscuits; malt liquor; wine, etc. Milk is usually given skimmed, and may be rendered palatable by first mixing in it a little sugar. The horse may get one or two gallons of it daily. Eggs may be given raw as a drench, or may be boiled hard and mashed up in the milk which the horse is to get. The yolk of egg consists almost entirely of fat, and the white is largely composed of albumin, which is a flesh-former. Horses soon learn to become fond of bread and biscuits. A couple of quarts of stout, ale, or porter, or half a bottle of wine, may be given daily. Malt liquor and wine have really very little nutritive value, their use being chiefly to stimulate the appetite; hence, when they fail to accomplish this object, we may conclude that they are doing little or no good, and, possibly, some harm.

The articles of diet mentioned under the heading of "laxative food," also possess valuable nutritive properties, though in varying degrees. They may be employed, with proper discrimination, in all stages of disease.

WATER.—As a rule, the sick, as well as the healthy horse should have a constant supply of fresh drinking water. The amount may be curtailed, and the "chill" taken off in some exceptional cases, as that of purging. In various diseases, it is well to slightly warm the water, the temperature of which, however, should not be raised to more than 80° F. The ill effect of drinking a quantity of cold water in the case of inflammation of the lungs, or congestion of the liver, for instance, would be to cause contraction of the blood-vessels of the intestinal canal, and, consequently, to increase the blood pressure in the affected organs.

SALT.—A sick animal should be allowed, at least, three ounces of salt a day, or a lump of rock-salt should be kept constantly in the manger. Salt is a condiment which promotes digestion, and aids in the building up of tissue.

GROOMING.—A horse that is weak and depressed should not be worried by unnecessary grooming of the mere body-brush or dandy-brush type; although vigorous and well applied hand-rubbing (p. 664) or wisping, has a good general effect in removing deleterious substances from the system. In all cases, it is well to sponge out his eyes, nostrils, and dock; smooth over his coat; hand-rub his legs; "strip" his ears; take off the clothing he wore at night; and put on fresh clothing for use by day. The other portions of stable routine should be followed, in order to promote the animal's comfort and health.

EXERCISE.—In cases of injury, we should give exercise very gradually, so as to restore the function of the part, without interfering with its repair. After illness which has involved medical treatment, the owner should be most chary in permitting the horse to leave his stable until all danger of a relapse is past. The animal should then be put very gradually to work again.

CHAPTER XXVII.

Veterinary Medicines.

Weights.

The official scale of weights for medicines is as follows:—

1 ounce = $437\frac{1}{2}$ grains.
16 ounces = 1 lb. = 7,000 grains.

For convenience sake, and in deference to former custom, it is usual to accept 60 grains as equal to 1 drachm, and 8 drachms equal to 1 ounce.

Approximate Weights.

A threepenny piece = ...	20 grains.
A sixpenny piece = ...	40 ,,
A threepenny piece and a sixpenny piece = ...	60 ,, (1 drachm.)
A shilling piece = ...	80 grains.
$3\frac{1}{2}$ sovereigns = ...	1 ounce.
Three penny pieces and a threepenny piece = ...	1 ,,

Two rupees and eight annas in silver weigh a little more than an ounce.

Measures.

60 minims = ...	1 fluid drachm.
8 fluid drachms = ...	1 fluid ounce.
20 fluid ounces = ...	1 pint.
8 pints = ...	1 gallon.

Roughly speaking, a minim may be considered equal to a drop, which, however, varies in size according to the nature of the fluid, and the shape of the portion of the vessel from which it is poured.

Approximate Measures.

1 teaspoonful	=	2 fluid drachms.
1 dessertspoonful	=	4 ,, ,,
1 tablespoonful	=	7 ,, ,,
1 wine or large beer bottle	= ...	$1\frac{1}{3}$ pint.

Doses According to Age.

The doses of the medicines prescribed in this book are calculated for what would be suitable for an average hunter or trapper 15 hands 3 inches high, and 5 years old or upward.

For a yearling	$\frac{1}{3}$ that for an aged horse.
For a two-year old	$\frac{1}{2}$,, ,,
For a three-year old ...	$\frac{2}{3}$,, ,,
For a four-year old	$\frac{3}{4}$,, ,,
For a five-year old	full dose.

Doses According to Size and Class.

For a 15.3 hunter or trapper, as laid down.
For a heavy cart horse, $\frac{1}{4}$ more than for a hunter.
For a 14-hand pony, $\frac{1}{5}$ less than for a hunter.
For a 13-hand pony, $\frac{2}{5}$ less than for a hunter.

List of Medicines for a Stable of Five or Six Horses.

For the benefit of my Indian readers I have affixed the letter (*b*) to those medicines which can be procured in Indian bazaars.

1. *Indispensable Medicines.*

Carbolic acid,* or Creolin	1 pint.
Linseed oil (*b*)	8 pints.
Chloral hydrate	8 oz.
Turpentine, oil of (*b*)	1 pint.

2. *Very Useful Medicines.*

Aloes (*b*)	8 oz.
Alum (*b*)	1 lb.
Ammonia, strong liquid	4 oz.
Bluestone (*b*)	1 ,,
Camphor (*b*)	4 ,,

* Calvert's disinfecting carbolic acid may be substituted for the glacial and more expensive form. When given internally, a third more of it should be used than what would be required of the pure acid.

Epsom salts (sulphate of magnesia)	2 lb.
Iron, sulphate of (*b*)	2 "
Mercury, biniodide of	$\frac{1}{2}$ "
Nitre (nitrate of potash) (*b*)	1 "
Nitre, sweet spirits of	1 pint.
Soda, bicarbonate of (baking) (*b*)	2 lb.
Tartar emetic	4 oz.

3. *Useful.*

Ammonia, carbonate of	2 oz.
Arnica, tincture of	8 "
Arsenic (*b*)	1 "
Belladonna, extract of	4 "
Cantharides	$\frac{1}{4}$ "
Catechu (*b*)	2 "
Chloroform	12 "
Goulard's extract	1 pint.
Ipecacuanha	4 oz.
Indian hemp, extract of	4 "
Nitric acid	2 "
Nux vomica (*b*)	2 "
Potassium, iodide of	8 "
Sal-ammoniac (*b*)	2 lb.
Silver, nitrate of	$\frac{1}{2}$ oz.

Acetic Acid

is used for removing warts from delicate parts.

Ale, Beer, and Stout

are excellent tonics, especially when the horse is recovering from the effects of a debilitating disease. A quart may be given three times a day.

Aloes

is the usual purgative in veterinary practice. It ought to be employed with great care by amateurs; as its injudicious administration is very dangerous to the lives of horses to whom it is given. Aloin (p. 600) is quite as effective and is much safer than aloes. Linseed oil or Epsom salts will generally prove an efficient substitute.

Barbadoes aloes is the only kind of aloes which is used in horse practice.

CHARACTERS.—The best is of a liver-brown colour, presenting a dull fracture when broken, and of a dull yellow appearance when

reduced to powder, an operation that is accomplished with some difficulty, which may be overcome by adding a few drops of ether. It is soluble in boiling water.

COMPOSITION.—It is composed of its active principle, aloin, mixed with certain resins and other substances.

ACTIONS.—In small doses, it appears to act as a tonic,* and alterative,† in improving the general health. In full doses, it is a purgative, though it acts sometimes as a diuretic, especially when in solution. Externally it can be used in the form of a fine powder, as an application to wounds.

It is rapidly absorbed into the system, and seems to be excreted into the large intestines, thereby increasing their motion.

Aloes generally takes from eighteen to twenty-four hours to produce a purgative effect.

As it appears to be a liver stimulant, we should be careful in giving it in cases of disease of that organ.

DOSES.—As a tonic or alterative 1 to 2 drachms; as a purgative, from 4 to 10 drachms.

The action of this drug is influenced by the breed and individual peculiarities of the animal; by the country in which he lives; by the nature of the food he eats; by the condition of his stomach at the time he takes the physic; by his state of health; and by the nature and quantity of the food and drink which he partakes of after getting the physic.

Some horses, especially slack-loined, "washy" animals, are very easily purged. As a rule, the heavier the horse, the more aloes will be required to purge him. In Scotland, horses need about one-and-a-half times the amount of aloes which would do in the south of England or in Ireland. This, I believe, is owing to the large amount of woody fibre contained in the hay made in the first-mentioned country. My experience of Indian horses is that they are very susceptible to the action of aloes. Animals fed chiefly on corn are more difficult to purge than are those which are kept on grass and other green food. When restricted to bran mashes, the bowels are readily acted upon. If aloes be given on an empty stomach, its effect will be far more severe than if that organ were in a full condition. Drinking cold water soon after this drug is given, increases its purgative effect; often to a dangerous extent. When there is

* Tonics are medicines which permanently strengthen the body or its parts.

† Alteratives have certain beneficial though ill-understood effects on the nutrition of the system.

irritation of the bowels—which may be shown by diarrhœa or by the presence of mucus in the dung—and, generally, if there be existing any acute affection of the chest or air-passages, purgation is easily excited by a moderate dose of aloes. Hence, it should not be used as long as these conditions are present.

For a hunter or trapper, 4½ or 5 drachms will usually be sufficient as a purgative; though 6 drachms may be given in England to a cart-horse, which in Scotland may safely get an ounce. In India I have usually found 4 to 4½ drachms quite enough for an ordinary animal.

MODES OF ADMINISTRATION.—In most cases I would advise that the aloes should be given in a ball (p. 628) instead of in a drench; for in drenching there is danger of a part of the fluid getting spilt. If this occurs, it will generally be difficult to tell how much has escaped. Aloes is nearly, if not quite, as rapidly absorbed in a solid as it is in a fluid state; and, if given in the former condition, no uncertainty can exist as to the quantity swallowed.

If a physic ball does not act in a day or two, a second bolus should on no account be given for at least a week, lest severe if not fatal superpurgation may ensue. The same rule should be observed if a ball breaks up in a horse's mouth. We should remember that the longer aloes takes to act, the greater is the danger of superpurgation (p. 425).

If possible, aloes should not be given, unless the animal is properly prepared for the physic (see next page).

Aloes should not be given, as a rule, if the horse is in slings, which might exert injurious pressure on the abdomen.

Alterative Ball.

Barbadoes aloes	1½ drachm.
Tartar emetic	1 ,,
Nitre	3 drachms.

Treacle or lard sufficient to form a ball.

Ordinary Physic Ball.

Barbadoes aloes	5 drachms.
Ginger	2 ,,

Treacle or lard sufficient to make a ball.

The presence of the ginger appears to increase the action of the aloes, and to diminish the chance of griping.

Strongly Purging Ball.

Barbadoes aloes	6 drachms.
Tartar emetic	2 "
Ginger	2 "

Treacle or lard sufficient.

If required for immediate use, a ball can be made up by adding a little water to the powdered aloes, without any treacle or other substance to make its particles adhere together.

Ready-made balls of aloes can be obtained at any large chemist's shop.

Solution of Aloes.

Powdered Barbadoes aloes	1 part.
Water	7 parts.
Spirits of wine	1 part.

Dissolve the aloes with the water in a water bath, which consists of a vessel placed inside another vessel containing water. Care should be taken that the temperature of the solution does not at any time rise beyond 120° F. "Exposure to a temperature exceeding 150° F. alters the composition of aloes and impairs its purgative property" (*Finlay Dun*). When the aloes is dissolved, add the spirits of wine. An ounce of this solution will contain a drachm of aloes.

If time be an object, the aloes for a drench may be dissolved in a pint of warm water.

A quarter more aloes than would be required for a ball should be allowed for a drench, in order to make up for loss by spilling.

MANAGEMENT OF THE HORSE BEFORE AND AFTER GIVING ALOES.—For at least a day before the physic is administered, the animal should be given only bran mashes and hay, and the allowance of the latter should be somewhat restricted on the last night. "The physic is given on an empty stomach, early in the morning; immediately afterwards a bran mash is given; that over, the horse goes to exercise for perhaps an hour, watered when he returns. The water should be as warm as he will take it, and he should have as much as he pleases throughout the day. Bran mash should be given as often as corn usually is, and better warm than cold; if both are refused, bran may be tried, but no corn, and but little hay. Sometimes gentle exercise may be given in the afternoon, and also next day. The physic usually begins to operate next morning, though it rarely takes effect in twelve hours, frequently not for thirty. When the physic begins to operate, the horse should stand in the stable till it sets, which may be twelve hours" (*Dick*).

Physic is said to "set" when the evacuations cease to be watery, and the dung assumes its usual form.

Aloin

is the active purgative principle of aloes, to which it should always be used in preference, if a little extra expense can be afforded. Probably the best kind is obtained from Barbadoes aloes, and is called Barbaloin. It acts quicker (in about fourteen hours), and is safer, in that it causes less depression, loss of appetite, nausea, griping, and straining than aloes; and is quite as effective. Besides, it is devoid of the sickening smell and taste of aloes, and it is not liable, like aloes, to set up excessive staling (diuresis), instead of purging. It is about $2\frac{1}{2}$ times as active. Hence, 2 drachms of aloin will purge a horse quite as well as 5 drachms of aloes.

Alum

is soluble in 18 parts of cold water. Its astringent effect is owing to its power of coagulating albumin. Dissolved in water, or used in the form of powdered burnt alum, it is a fairly good application for sores or wounds. Burnt alum can be prepared by heating to dryness, alum which is placed over a fire on a metal or earthen plate. It can be procured at any chemist's shop.

Ammonia

is used in making stimulating applications; and, internally, as a general stimulant. Liquid ammonia is made by adding two parts of water to one part of strong liquid ammonia (S. G. ·891).

Soap Liniment.

Soap	2 oz.
Strong liquid ammonia	1 ,,
Water	4 pints.

Boil the water and dissolve the soap in it. When cold, add the ammonia.

Stimulating Liniment.

Soap liniment	$\frac{1}{2}$ pint.
Strong liquid ammonia	1 to 2 drachms.

Ammonia, Carbonate of,

is a valuable stimulant. Dose, 2 to 4 drachms. If given in a drench it should be largely diluted.

Ammonium Chloride (Sal-ammoniac).

See p. 541.

Arnica.

Internally, it is a useful stimulant. It appears to have a special action in increasing the circulation of blood in the surface of the body. Dose of the tincture, 1 to 2 oz. in a pint of water.

Arsenic

is an alterative and tonic. Its good effects, when given *internally*, are well marked in skin diseases and in surra. As a rule, it should not be given continuously for more than ten days at a time; as it accumulates in the system, and may tend to cause corrosion of the coats of the stomach and intestines. *Externally*, it is used as a caustic.

For treatment of arsenical poisoning, see p. 578.

Dose, usually 5 grains; in surra, up to 20 grains.

Arsenic is most conveniently given in the form of *liquor arsenicalis*, which contains 4 grains to the ounce.

Atropine

is the active principle of belladonna. One-third to 1 grain of the sulphate of atropine, dissolved in water, may be injected subcutaneously (p. 633). The *liquor atropinæ sulphatis* which is sold by chemists, contains one grain of atropine sulphate in 100 minims.

Beer.

See "Ale."

Belladonna.

See pp. 340 and 433. Externally, a mixture composed of extract of belladonna and glycerine—of the consistency of thick cream—is a useful application for recent sprains.

Blisters.

See "Cantharides" and "Mercury, Biniodide of."

Boric Acid (*Boracic acid*).

See p. 68. Antiseptic cotton-wool is made by steeping cotton-wool in boiling water which has as much boric acid in it as it will dissolve; then taking out the cotton-wool and drying it.

Calomel.

See p. 621.

Camphor

is, externally, a useful antiseptic, and allays irritation of the skin.

As it is an antispasmodic, $\frac{1}{2}$ oz. dissolved in a pint of oil is a good colic drench. See pp. 69 and 603.

Cannabis Indica.

See "Indian Hemp."

Cantharides.

Cantharides ointment (1 to 7 of lard) acts well as a blister.

Tincture of Cantharides.

The tincture of cantharides used in human practice is, as a rule, too weak for horses, for the blistering of which a specially strong tincture of cantharides is made by veterinary chemists. We may prepare a somewhat similar tincture by putting in a bottle 1 oz. of powdered cantharides and 1 pint of spirits of wine; keeping it corked for about a week, with occasional shaking up; and then filtering it.

Carbolic Acid

is a powerful antiseptic (pp. 67 and 69), and when externally applied, is a soother of pain.

There are three forms of carbolic acid in general use, viz., the pure or glacial form, Calvert's disinfecting, and crude carbolic acid. The first, except perhaps for internal use, is too expensive for employment in ordinary veterinary practice. When given internally, a third more of Calvert's preparation should be employed than would be necessary with the purer form. Crude carbolic acid, which is very cheap, may be used as a disinfectant. The impurities contained in impure carbolic acid have a very irritating effect, externally as well as internally.

When carbolic acid is dissolved in water, its effect is stronger than when dissolved in oil or glycerine. Koch has proved that "carbolic oil," made by mixing 1 part of the acid with 10 parts of olive oil, will not kill germs.

It (especially the impure kind) is sparingly soluble in water, but combines with glycerine in the proportion of 1 to 4, and may then be diluted by water to any required strength

It combines with camphor in the proportion of 1 to 2½.

It is used *internally* in cases of anthrax and flatulent colic in ½ oz. doses.

Externally it is used pure as a caustic; as an application to wounds (1 to from 20 to 40 of water, or 1 to 20 of glycerine); or in combination with camphor.

Phenicated Camphor.

Carbolic acid	...	...	...	...	1 part.
Camphor ...	...	...	...	...	2½ parts.

On page 69, I have given the composition of an antiseptic solution which has carbolic acid as its base, and which I have found very useful in India, South Africa, and other hot countries.

Carbolic Ointment

is made with carbolic acid, 1; soft paraffin, 12; hard paraffin, 6 parts. In hot climates the proportion of hard paraffin might be increased.

As a DISINFECTANT, crude carbolic acid is used with 20 times its bulk of water. To make a useful and convenient disinfectant, Dr. Voelcker recommends that sawdust should be soaked in as much of a solution of equal quantities of the crude acid and water as it will take up, and then set aside for use. A handful of this carbolized sawdust, sprinkled here and there in a stable, will tend to keep it free from foul emanations.

Carron Oil.

Lime water Linseed oil	...	...	...	...	equal parts.

It has long been used for scalds and burns, and has the advantage of being readily obtainable. For the purpose in question, better applications are given on page 109.

Catechu

is useful for checking diarrhœa. It possesses a very astringent taste. "Good samples are sweet, and free from bitterness and grittiness" *(Finlay Dun).*

DOSE, 2 drachms.

The action of the Indian variety is weaker than that which is used in English practice.

Chalk.

Prepared chalk is a valuable antacid in diarrhœa; it also forms a mechanical protection for the mucous membrane of the intestines.

DOSE, 1 oz.

Chinosol.

This comparatively new preparation is an admirable antiseptic when dissolved in water (1 grain to an ounce), and in this form can be used for wounds and sores. For disinfecting the hands, it should be dissolved only in distilled water, for it is precipitated by alkaline water and soap. A strong solution of chinosol should not be employed for the disinfection of instruments, as it has a corrosive action on them. Undiluted chinosol in powder has a very irritating effect on wounds. "The chief disadvantage to its general use is the readiness with which it is precipitated from solutions" ("Brit. Med. Journal").

Chiretta

is a valuable stomachic which is common in India. Its properties are very similar to those of gentian. If pounded and mixed in the food, horses will soon learn to eat it readily. Chiretta and nux vomica appear to be the only bitters which horses will voluntarily consume.

DOSE, 1 oz. twice a day.

Chloral Hydrate

is a very useful agent for soothing pain and producing sleep, which, under its influence, comes on in a manner nearly similar to that of natural sleep, and it has little or no bad after effects. It can be given with advantage, half an hour before painful operations, such as firing, neurotomy, castration and docking; and also to horses which are difficult to shoe. See page 626.

DOSE, ½ to 2 oz. in a pint of water. The usual dose is one ounce.

Chloric Æther

is made by mixing 1 fluid part of chloroform with 19 fluid parts of rectified spirits. It is a useful antispasmodic in cases of colic.

DOSE, 1 to 1½ oz.

Chloroform

is the best agent for producing general insensibility in horses during surgical operations. To prevent it from becoming decomposed, it should be kept in glass stoppered bottles in a cool place and covered with blue paper.

USES.—The uses of chloroform are: (1) To produce insensibility to pain; and (2) to obtain muscular relaxation, as in breaking down adhesions (p. 274), in cases of difficult foaling, and in the reduction of inguinal hernia (p. 287).

ACTION.—There are three stages in the continued effect of chloroform on the horse: (1) Nervous excitement, which will be shown by struggling and frequently by neighing. During this time the increased action of the heart is manifested by violent throbbing of the carotid artery, the rapid pulsations of which can be seen in the jugular groove (p. 118). (2) Insensibility. (3) Paralysis of the organs of breathing, and finally paralysis of the heart. In giving chloroform for ordinary surgical purposes, it is evident that we should not allow its action to go beyond the second stage. The more quickly insensibility is obtained, within of course safe limits, the less dangerous will be the effect; for if its production is induced by the prolonged inhaling of even a comparatively small proportion of chloroform in the respired air, the horse's system will get saturated with the drug, and consequent danger of death will ensue from failure in the action of the heart. As the horse bears the effect of chloroform extremely well, we should not be afraid to give it to him in a fairly concentrated form. At the same time, we must remember that he requires air for breathing. Profiting by the knowledge of the weakening effect which the prolonged administration of chloroform, even when well mixed with air, has on the heart; we should, as soon as the horse is rendered insensible, give him only sufficient of the vapour to keep him under its influence to the extent we require. In judging of the state of safety in which the patient is when under the influence of chloroform, we should be guided almost entirely by the condition of his breathing; for the action of the lungs in chloroform poisoning, ceases before that of the heart. Stoppage of breathing and irregular breathing are two symptoms of chloroform poisoning, the observation of which should at once warn the operator to discontinue the administration of the drug. Holding in the breath at first, will be a sign that the chloroform is not sufficiently diluted with air. As

chloroform produces insensibility by causing the brain to become deprived of blood; we should, to facilitate the action of this drug, keep the animal's head on a higher level than his body. On the other hand, when we wish to restore consciousness, we should lower the head. The advisability of the precaution of withholding food and water from the animal for some hours before giving chloroform is self-evident. As difficulty of breathing, in chloroform poisoning, is frequently due to spasm of the muscles which cause the epiglottis to close the opening (the glottis) into the larynx; it is well to antagonise their action, in such cases, by drawing the tongue forward.

AMOUNT AND TIME REQUIRED.—The amount of chloroform required to put a horse under the influence of this drug, varies greatly according to the mode in which it is given. According to the present somewhat inexact methods, the amount varies from about 2 oz. to 10 oz. As a rule, I use about 6 oz. Twenty minutes is an average time for bringing a horse fully under the influence of chloroform.

ADMINISTRATION.—In an operation requiring the use of chloroform, one man, if possible, should be solely concerned with the production of insensibility, so that the operator's attention may not be distracted from his legitimate work. After the horse has been cast, the chloroform may be given by a specially made muzzle (I generally use Russell's muzzle, which I find very convenient); by a leather or wire muzzle, inside which a sponge saturated with chloroform is placed; or a towel may be folded in the form of a funnel, and a small sponge or some cotton-wool may be put in its centre to receive the chloroform, which should be poured out a little at a time. In utilising this last-mentioned contrivance, the horse, being kept with his head resting on a bundle of straw, should be made to inhale the fumes through his upper nostril, while the lower one is kept more or less closed by the hand, so as to regulate the amount of air. In any of these cases, we may commence with 1½ oz. of chloroform, and add a like quantity of it from time to time, as may be required. With Russell's inhaler, I generally add 1½ oz. at intervals of about seven minutes. Mr. Harold Leeney, M.R.C.V.S., tells me that instead of an inhaler, he prefers to use, for the administration of the chloroform, a sponge, which he places inside one of the nostrils, after having greased the inside of that nostril, so as to prevent it being irritated by the chloroform. He regulates the inspiration of the chloroform, by means of the pressure of his hand on the other nostril. More or less successful attempts have been made

to construct an equine chloroform muzzle on the same principle as that which Junker devised for human beings, and which presents the chloroform to the patient in a vapour of easily regulated concentration. We can ascertain the amount of influence which the chloroform has over the animal by noting the degree of sensibility his eye manifests when touched by the finger. As advised by Möller of Berlin, the best spot to select when doing this, is the inner corner (inner canthus) of the eye on the haw (*membrana nictitans*). We may also feel if the muscles of the tail offer any resistance to the dock being bent and extended; and may pinch the parts under the tail to still further satisfy our minds. I wish to impress on my readers the necessity of inducing complete insensibility, when our object is to obtain as much muscular relaxation as we can. Hence, in such a case, we should abstain from operating until external irritation fails to produce reflex action. If, however, we give chloroform merely to deaden pain, we need not push it so far. After the operation is over, it is well to allow the animal to sleep off the effects of the drug, which he will generally do in about an hour. The hobbles or the apparatus should not be removed until consciousness has returned; for he is liable to injure himself by struggling when "coming to."

Russell's chloroform inhaler consists of a canvas bag provided with a metal bottom into which a tray fitted with sponge can be passed. Having cast the horse (by Mr. Over's method, page 642, or by tying up one fore leg and pulling the head round, page 646), we get an assistant to put the inhaler over the horse's muzzle, take out the tray of the inhaler, saturate the sponge with about $1\frac{1}{2}$ oz. of chloroform, return the tray, and proceed to render the animal insensible. When it is necessary to replenish the supply of chloroform, say, after seven minutes, we can again remove the tray, while retaining the inhaler on the horse's head. We can easily regulate the supply of air as may be necessary.

Cagny and Gobert state that it is advisable before giving chloroform, to make a subcutaneous injection (p. 633) of $1\frac{1}{2}$ grain of morphine hydrochloride and $\frac{1}{12}$ grain of atropine sulphate (p. 601) in 3 drachms of distilled water; because this injection greatly lessens the excitement, hastens insensibility, checks heart failure, and increases the effect of the chloroform, the quantity of which can consequently be reduced.

Citrine Ointment (*Nitrate of Mercury Ointment*).

See p. 621.

Cocaine.

This alkaloid is a very useful agent for producing local insensibility to pain. If 5 or 6 drops of a solution of 1 grain of hydrochlorate of cocaine in 20 minims (or drops) of water be placed on the surface of the eye, that part will, in from 5 to 10 minutes, lose its sensibility to such an extent that it can be handled freely without causing discomfort to the animal. We may use a solution of the hydrochlorate of cocaine of double that strength (say 10 grains in 100 minims of water) for hypodermic injections (p. 633) to deaden the feeling of a part. For the temporary removal of lameness below the fetlock, or for finding if lameness is due to pain above or below that part, Pader advises a subcutaneous injection of cocaine on the outside and on the inside of the leg, just above the fetlock, at the spot usually chosen for the high operation of plantar neurectomy (p. 670); each injection consisting of 2 grains of the hydrochlorate of cocaine dissolved in 40 minims of distilled water, with a little bicarbonate of soda to neutralise it. The action of the cocaine is increased by heating the solution to about 85° F. The amount of cocaine in each injection might be safely increased to 3 grains. After these injections, the lameness disappears in about ten minutes, and returns in about half an hour. For the temporary relief of a case of painful cracked heels, it is well to use a solution of 5 grains of the hydrochlorate in 20 drops of oil of cloves.

Some Continental veterinary surgeons speak highly of morphia combined with cocaine for deadening pain in foot diseases, for even a week or longer. The following subcutaneous injection, which produces its effect in from 5 to 10 minutes, may be made on each side of the plantar nerve (p. 670):—

Hydrochlorate of cocaine	$2\frac{1}{3}$ grains.
Morphia	$1\frac{1}{2}$ grains.
Distilled water	$1\frac{1}{2}$ drachms.

Cotton Wool, Antiseptic

is prepared by impregnating cotton-wool with various antiseptics (boric acid, iodoform, corrosive sublimate, etc.), so that layers of such material placed over a wound will protect the part from the entrance of bacteria (p. 63). The same remark applies to wood wool, and antiseptic gauze. These protective agents can be obtained from any large chemist.

Creolin

"is a coal-tar product from which carbolic acid is excluded" *(Whitla).* It readily dissolves in water, with which it forms a milky solution. It is much less poisonous (whether taken by the mouth or absorbed by the skin) and less irritating to the skin or to broken surfaces than carbolic acid, and is an equally effective antiseptic. ½ oz. of it might be given *internally. Externally,* it may be used pure or diluted with water up to 40 times its bulk; and can be employed as a disinfectant in the same manner as carbolic acid.

Jeyes' Fluid is the same as the French Cresyl-Jeyes, and the German Creolin Pearson. Jeyes' Creolin is a superior preparation to Jeyes' Fluid. For surgical wounds 2½ per cent. and for foul wounds 5 per cent. may be used. Despite the statements made by the manufacturers of these and other proprietary antiseptics, the fact remains that all antiseptics and disinfectants are more or less poisonous.

Epsom Salts *(Sulphate of Magnesia)*

is a useful laxative in fevers, chest affections, and in derangements of the liver. Its action as a purgative is somewhat uncertain. It can be used when the dung is hard, clay-coloured—indicating suppression of bile—and covered with mucus, or when passed out in a slimy state, both of which two last-mentioned conditions show irritation of the bowels. In such cases, the employment of aloes is generally inadmissible, owing to its stimulating action on the liver.

Epsom salts may be given two or three times a day in doses of 4 oz. in the food, or 8 oz. in 1½ pint of water as a drench.

Eserine,

which is one of the alkaloids of calabar bean, acts as a purgative by stimulating the muscular coat of the stomach and intestines. It also causes contraction of the pupil, whether applied locally, or when taken into the system by the mouth. It is of great benefit in cases of flatulent colic and colic caused by indigestion; but it is dangerous in cases of constipation, owing to its rapid and violent action. It is generally used in the form of the sulphate; the doses being, according to Finlay Dun, 2 to 3 grains by the mouth, ½ grain intra-tracheally (p. 635), and 1 to 1½ grain subcutaneously (p. 633). "In intestinal obstruction, more prompt

and certain effects are obtained by the addition of 2 or 3 grains of pilocarpine" (*Finlay Dun*). This combined medicine will generally purge the horse in about half an hour. Veterinary-Surgeon Desmond, who has treated over 500 cases by the intra-tracheal injection of eserine, has devised the following solution after much careful research:—

Sulphate of eserine	20 grains.
Hydrochlorate of pilocarpine	60 „
Pure carbolic acid	10 drops.
Distilled water	5 ounces.

Each drachm of this solution contains ½ grain of eserine and 1½ grains of pilocarpine. The doses recommended by Veterinary-Surgeon Desmond for intra-tracheal injection are: Heavy draught-horse, 3 drachms; carriage-horse, 2 drachms; hack, 1½ drachm; and pony, 1 drachm. This solution will keep good for any length of time. Ordinary solutions of eserine become quickly altered in composition. Opium or morphine should not be given at the same time as eserine, for their action is antagonistic to it.

Ether, Nitrous Spirit of.

See "Nitre, Sweet Spirits of."

Formalin.

This drug, which is a 40 per cent. solution of formic aldehyde, is used chiefly as a disinfectant (1 per cent. solution), and has proved beneficial as an antiseptic in navel-ill (p. 535). Percentages quoted are those of formic aldehyde, and not of formalin.

Solutions are made as follows:—

10 p.c.	solution, add	1 part	of formalin	to	3	of	water
8 p.c.	„	„	„	„	4	„	„
5 p.c.	„	„	„	„	7	„	„
4 p.c.	„	„	„	„	9	„	„
2 p.c.	„	„	„	„	19	„	„
1 p.c.	„	„	„	„	39	„	„

Formalin was largely used as a disinfectant, in the form of spray, during the outbreak of plague at Capetown in 1901.

Gentian

is an excellent stomachic. The extract, of which ¼ oz. may be given, is the most convenient form to use. Or we may give from ½ to 1 oz. of the powder in 1½ pints of ale or stout with 1 oz. of sweet spirits of nitre.

Goulard's Extract.

This popular name is sometimes applied to the *liquor plumbi subacetatis* of druggists.

For cracked heels, mud fever, etc., we may use 1 part of the solution to 4 parts of olive oil, cream, or glycerine.

Ichthyol,

which is the ichthyo-sulphate of ammonium or of sodium, has been greatly praised by German veterinary surgeons ("Journal of Comp. Path.", June, 1900), as a remedy for cracked heels, grease, mallenders, sallenders, wounds, burns, saddle galls, itchy tail (and other forms of pruritis), inflammation of the joints, including those of navel ill, strains, bruises, etc. It is used externally either as a liniment (1 part or more of ichthyol, and 2 parts each of spirit or ether and water), or as an ointment (1 part of ichthyol to from 2 to 10 parts of lanoline, vaseline or oil). The hair of the part should be clipped off, and the liniment or ointment rubbed in twice a day. Internally it has been successfully employed in cases of purpura and septic pneumonia, by intratracheal injections of about 1 oz., or 3½ oz. by the mouth.

Indian Hemp (*Cannabis Indica*)

is a very valuable soother of pain, and may be used in doses of ½ to ¾ oz. of the extract for colic, and also for tetanus. In such cases, it acts far better than opium; because its effect lasts longer, and does not produce so much constipation, or such distressing head symptoms. The present preparations, such as the extract, are liable to deteriorate by keeping, and are not of uniform strength. These objections will no doubt be rectified in the near future by the employment of its active principle.

Iodine.

For its action in "Diabetes," see p. 516.

Iodine Ointment.

Iodine	1 part.
Lard	8 parts.

Useful in cases of parasitic ringworm.

Tincture of Iodine.

Iodine	$\frac{1}{2}$ oz.
Iodide of potassium	$\frac{1}{2}$ oz.
Rectified spirit	1 pint

Liniment of Iodine.

Iodine	$2\frac{1}{2}$ oz.
Iodide of potassium	1 oz.
Glycerine	$\frac{1}{2}$ oz.
Rectified spirit	1 pint.

The liniment is 5 times stronger than the tincture. These three preparations of iodine are absorbents and counter-irritants.

Iodoform,

which is an admirable antiseptic, does not destroy bacteria; but, according to Behring, it induces chemical changes in the poisonous materials which they produce, so as to render them harmless. Unlike corrosive sublimate, and, to a lesser degree, carbolic acid, iodoform has no irritating effect on a wound. Iodoform requires the presence of pus to cause it to become decomposed and to give off its iodine, to which it owes its antiseptic property. Hence, iodoform will not form a dry scab in the first instance. It can be used dry, or with eucalyptus oil, in which as much iodoform has been dissolved as the oil will take up.

Ipecacuanha.

See p. 540.

Iron,

Sulphate of Iron.

should be kept in well-stoppered bottles; for if exposed to the air it will gradually become decomposed. It is a valuable tonic; although it is apt to have a constipating effect. If it upsets the digestion, it should be discontinued.

Preparations of iron should not be employed in cases of indigestion, or of diseased liver (p. 541).

Dose, 20 to 60 grains once or twice a day, mixed in the food.

A solution of 1 lb. to the gallon of water is an admirable disinfectant for stables. When brought into the presence of ammonia and sulphuretted hydrogen, the ammonia becomes fixed by being converted into the sulphate; and the sulphuretted hydrogen is decomposed by yielding up its sulphur to the iron.

Only green crystallised sulphate of iron should be employed for internal use. The impure kind will do for disinfection.

Dialysed Iron.

A solution of dialysed iron ($\frac{1}{2}$ oz.) diluted with water, to be given two or three times a day, is a valuable tonic, and is not liable to act injuriously on the digestion, or on the liver (when affected) like sulphate of iron.

Tincture of Iron.

The strong tincture of the perchloride of iron (*liquor ferri perchloridi fortior*) appears to act, when given internally, as an astringent to the walls of the blood-vessels; hence its use in bloody urine, etc. In such cases, it can be given in one-third drachm doses three times a day. For diarrhœa, give in a pint of water, 1 drachm twice a day, combined with $1\frac{1}{2}$ ounces of laudanum. Externally, it is useful for stopping bleeding.

The ordinary tincture of iron (tincture of steel) is made by mixing 1 oz. of the strong tincture with 3 oz. of distilled water.

Kerosene Oil.

See "Paraffin Oil."

Lanoline

is the grease obtained from sheep's wool. It forms a useful vehicle for applying medicines to the skin. For its action as a hoof ointment see p. 204.

Lard

is one of the best materials for making up ointments. Its tendency to become rancid can be corrected by melting it over a water bath and adding a fiftieth part of benzoin. Pure benzoated lard can be obtained ready made from any chemist. The usual adulterations of lard are water, salt, starch, and cotton seed oil. Mutton, venison, or beef kidney fat, horse fat, lanoline, goose grease, or vaseline, may be used instead of lard. To give any of these consistency in hot weather, we can mix with them a little beeswax.

Laudanum.

See "Opium, Tincture of."

Lime.

One part of lime is soluble in 1,500 parts of water. This solution (lime water) is beneficial to foals suffering from a deficiency of bone-forming material, and in diarrhœa when acidity is present. It may be given to yearlings in ¼-pint doses three times a day.

Linseed.

Cold drawn linseed oil is a safe and valuable laxative, in doses of from 1 to 2 pints. It forms an excellent vehicle for the administration of turpentine or carbolic acid. In small doses, it allays irritation of the mucous membranes, and appears to be particularly beneficial in diseases of the urinary organs. Its good effects on the skin are well marked. It may be given in doses of 2 oz. mixed through the food three times a day. See page 592.

As linseed oil is subject to much adulteration, we should take special precautions to obtain it pure. The linseed oil sold by oil and colour merchants, usually has been boiled and freely mixed with litharge (oxide of lead), which is a poison, or black oxide of manganese, so as to increase the drying property of the oil for the benefit of painters.

Magnesia, Sulphate of.

See "Epsom Salts."

Mallein.

DESCRIPTION.—Mallein was first manufactured by Kalning and Hellmann in 1891. It is a filtered liquid which is made from a pure culture of the bacilli of glanders, and which has been exposed, during its preparation, to a degree of heat that is amply sufficient to destroy them. It contains products formed by these microbes; but as it is entirely free from the presence of these organisms, it is incapable of causing this disease. It is prepared in bacteriological laboratories (for instance, that of the Royal Veterinary College, London), and can be obtained from them and from wholesale chemists, with directions as to its use. "Mallein should be kept in a cool place, and protected from light. Should it lose its transparency or become cloudy, it must not be used" (*McFadyean*).

THE USE OF MALLEIN depends on the fact that a properly performed injection of a certain quantity of it under the skin

of a glandered horse whose temperature is normal, almost always produces reactions which, in the vast majority of cases, may be accepted as a proof that the animal is suffering from glanders. Also, the absence of these reactions may, under certain narrowly limited restrictions, be regarded as unquestionable evidence that the animal is free from glanders. The typical reactions of mallein may be classed as local and general, the former consisting of a swelling at the seat of inoculation; the latter, of general disturbance, which is best marked by a rise of temperature, and which is also accompanied by depression of spirits, debility, and loss of appetite.

TESTING A HORSE FOR GLANDERS BY MEANS OF MALLEIN.—The animal should be in a normal condition of rest, and should be free from exciting or depressing influences. We may here note the remarks made on pp. 681 and 682, respecting increase of temperature caused by exposure to heat. The usual amount of mallein employed for injection is 18 minims (one cubic centimetre). The syringe should be carefully disinfected (p. 70) before use, especially when several horses are being tested, in which case, neglect of this precaution might allow the disease to be transmitted to healthy animals. "The best form of syringe is one with an asbestos piston, as the whole instrument may then be sterilised by boiling it in water for five minutes before use" *(McFadyean).* The side of the neck is a good site for the injection, because it offers a flat surface for the observation of the expected swelling. The injection should be made into the loose tissue immediately under the skin, and not into the muscles of the part, as we shall see further on. Care should be taken that no air passes along with the fluid from the syringe, and that the whole of the mallein is injected. The time for the injection (whether morning or evening) may be chosen, to meet the convenience of the operator. The temperature of the animal's rectum (p. 681) should be taken at the time of injection, six hours after it, and every subsequent three hours, up to the fifteenth or eighteenth hour.

The chief typical points about the local reaction to mallein are that the swelling is large, hot, painful, and well defined, and that it continues longer than an ordinary swelling produced by a similar puncture would do. Its size is probably its least characteristic feature. "In interpreting the local reaction to mallein, attention must be paid to two points, namely, the extent of the swelling, and the period at which it reaches its maximum size. The rule as regards the first of these is that in the non-glandered horse, the swelling which forms at the seat of infection is seldom or never more than three inches in diameter, while in

a glandered horse, it is seldom or never less than five inches in diameter, and not rarely it is nearly twice that. The rule regarding the second point is that, in a non-glandered horse, the local swelling attains its maximum size during the first fourteen or sixteen hours after the injection, and then rapidly declines, so that it has nearly or altogether disappeared by the twenty-fourth hour. In a horse suffering from glanders, the tumour continues to increase in size to about the thirtieth hour after inoculation; it persists for two or three days; then gradually recedes, and does not finally disappear until the fifth or sixth day (Nocard). Inflamed lymphatic glands may be seen radiating from the tumour, which may be so painful as to cause lameness of the fore leg of the side upon which it is situated" *(McFadyean)*. These remarks specially apply to a glandered horse which has been injected with mallein for the first time, and which is under conditions that are favourable for this test.

Although little or no swelling may be visible at the seat of the injection, the fact that reaction has taken place locally may be clearly manifested by the painful condition of the part. The absence of well-marked swelling is often caused by the injection having been made too deeply. Mr. Porch, F.R.C.V.S. ("Veterinary Record"), states that the appearance of the swelling is occasionally delayed for two, and even for three days in exceptional cases. Repeated injections often have the effect of diminishing the size of the swelling, and may also delay its appearance.

The rise of temperature (which is at least 2.5° F. and may sometimes be as great as 6° or even 7° F.) is characterised by the fact, that having reached its maximum in about 15 hours, it does not disappear until about 24 or 30 hours after inoculation. If the horse is free from glanders, the temperature will not be affected.

If, at the time of inoculation, the temperature be high—say, 102° F. or more—the reactions may be less apparent, or altogether wanting in an affected animal. The "Journal of Comparative Pathology," December, 1892, records two cases of horses whose respective temperatures were 103.1° F. and 103.4° F., at the time of inoculation. Their temperatures fell, instead of rising; the condition of the swelling at the seat of inoculation was normal, being about the size of a walnut; the appetite of one of them continued good; and yet both of them were proved by *post-mortem* examination to be thoroughly infected with glanders.

A decided opinion should not be passed, unless both reactions take place; although an exaggeration in one may make up for a deficiency in the other. Mr. Porch believes that a local reaction

is much more diagnostic than a rise of temperature. Mr. Hunting regards them as equally important.

The better the reactions are marked, the stronger will be the suspicion that glanders is present.

A horse may fail to react, on account of the shortness of time between infection and this test, in which case the period of latency is probably less than a week. "In one series of experiments, Nocard infected four horses by feeding, and when he tested them with mallein on the sixth day afterwards, the reaction was so intense that for three days it was feared that they would die. In Nocard's second series of experiments, the first mallein test subsequent to infection was made on the fifteenth day, and they all reacted in the clearest manner." ("Journal of Comparative Pathology"). Repeated injections of mallein with short intervals between them, render a still infected animal liable to give no reaction. If we have reason to suppose that the non-reaction has been due to this cause, we should make a second test, not less than two months after the first one. In a glandered horse, mallein appears to have the effect of causing the bacilli of this disease to become isolated and encapsuled in the tissues, especially in the lungs. Although they may be thus rendered inert for a time, they may escape later on from their surroundings, and may reinfect the animal. The longer the interval between these two tests, when neither of them have given any reaction, the greater is the probability that the horse is free from the disease. Mr. Hunting tells us that repeated injections of mallein decrease the extent of the local reaction much more than they do that of the rise of temperature.

VALUE OF MALLEIN AS A MEANS FOR RECOGNISING THE PRESENCE OF GLANDERS.—Extremely numerous and most elaborate experiments have been made in England and on the Continent during the past ten years, as to the value of mallein in this respect, with the result that our veterinary surgeons are practically unanimous in regarding it as an indispensable and highly reliable, though not absolutely infallible, aid to the diagnosis of this disease. Its employment, which is the only possible method of deciding the case, when the suspected animal shows no outward signs of glanders, is easy of accomplishment, expeditious, cheap, and entirely harmless to either healthy or diseased horses. For distinguishing ulcerative lymphangitis (p. 505) and epizootic lymphangitis (p. 503) from farcy, mallein is absolutely indispensable, unless the observer is furnished with a bacteriological microscope, and knows how to use it.

It is said that mallein is not such a reliable test for glanders in mules, as in horses.

Mr. Hunting considers that mallein detects glanders in at least 98 per cent. of the cases in which it is employed. We may unhesitatingly accept the correctness of this statement, when applying it to animals which are under favourable conditions for this test. A veterinary surgeon who exercises an average amount of care,. would certainly not have more than 5 per cent. of failures in diagnosis with mallein, supposing that he tried it on a large number of horses.

Mallein is especially useful in those obscure cases in which no outward symptom of the disease becomes apparent for a long time. In this respect, it is particularly valuable to owners of large studs of horses, in which glanders has broken out, or is supposed to exist, so that the healthy animals may be separated from those which are affected.

The chief *objections to the value of mallein* are as follows:—First, that some authorities aver that mallein produces its typical reactions in certain diseases other than glanders, as, for instance, inflammation of the lungs and bronchitis. Even if this were true, the fact that these diseases can generally be recognised, greatly lessens the chance of any of them being mistaken for glanders. Second, that healthy horses are said to occasionally react to mallein. Both of these statements are entirely opposed to the experience of the great French authority, Nocard ("Journal of Comparative Pathology," December, 1897), and to that of English veterinary surgeons. Third, that some glandered horses fail to react, a remark which has reference only to three classes of infected horses, namely, those which are in the short incubative stage (p. 495); those which have been subjected to a series of injections of mallein with unduly brief intervals of time between them; and those which are very badly glandered, and which would consequently be visibly affected. These objections have no practical weight. We should bear in mind that mallein is a comparatively new medicinal agent, and that the arguments against its adoption were made when it was on its trial, and when its manufacture was often carried out in a very imperfect manner.

POST-MORTEM APPEARANCE OF THE LUNGS AFTER AN INJECTION OF MALLEIN.—"With one injection of mallein, especially the mallein obtained from the Pasteur Institute, there was a distinct alteration in the *post-mortem* appearance of the lungs, if the animal was killed within 48 hours after the injection. There were red streaks and spots, and, as pointed out by Mr. Humphreys, a peculiar dropsical condition of the lungs which

enabled him by the mere pressure of the fingers to see at once that a horse had been recently malleined" *(Hunting)*.

CURATIVE EFFECT OF MALLEIN ON GLANDERS.—As one out of many similar instances, Nocard ("Journal of Comp. Path." Dec., 1897) relates that he superintended the testing by mallein of 10,231 horses belonging to the Compagnie Général des Voitures de Paris, and that 2,037 reacted, out of which 687 became affected with outward symptoms, and were slaughtered. *Post-mortem* examinations were made on a large number of those which had ceased to react and which were subsequently cast, owing to old age, unsoundness, or accident; the result being that all the tubercles found in their lungs were fibrous or calcareous. He also proved by inoculation that none of these nodules contained living bacilli of glanders. Consequently he was fully justified in considering that all these animals had recovered.

As glanders was found among the horses (4,439 in number) of the Glasgow Corporation Tramways, in 1899, the mallein test was applied to them, and 278 reacted. These suspected animals were tested monthly, with the following results:—

1st test	278 reacted.
2nd ,, ...	49 ,,
3rd ,, ...	9 ,,
4th ,, ...	5 ,,
5th ,, ...	2 ,,
6th ,, ...	1 ,,
7th ,, ...	0 ,,

All the horses which had failed to react to the third test continued, apparently, in perfect health. Of those which had reacted to the first three tests, one became clinically affected after the third test, one after the fifth, and one after the sixth; and these three animals with outward symptoms were destroyed. *Post-mortem* examination showed that glanders was fully developed in them. For purposes of demonstration, two animals which had reacted once, three twice, one three times, and one which had reacted four times were killed and their bodies examined. The reports by Mr. T. B. Hamilton, Dr. Buchanan, and Professor McFadyean on these seven horses showed that they had been previously affected with glanders, but that they were free from the disease at the time of slaughter.

Mr. Hunting ("Veterinary Record") informs us that experiments in London show that 50 per cent. of horses which have reacted to mallein, but which have manifested no outward symptoms of glanders, recover.

Babès, Hellmann, Pilavios and others state that they have cured early cases of glanders by injections of mallein at intervals of three or four days, until the mallein ceases to cause reaction. Pilavios says that this treatment hastens death in advanced cases of the disease. Bonome mentions that an affected man was cured by mallein after a six weeks' course of treatment.

Professor McFadyean ("Journal of Comp. Path.," March, 1900) treated a glandered gelding, one of whose hind legs was much swollen and had farcy buds on it, by repeated injections of very large doses (up to 100 times the usual quantity) of mallein, with the result "that this horse, although showing external symtoms of farcy, became quite cured (or recovered). Afterwards, when inoculated with virulent glanders bacilli, it again contracted the disease, and it had again recovered before it died from another cause." Although these facts may not be absolute proof, they are very strong reasons for assuming, that mallein, especially in very large doses, has a curative influence on glanders. We know that reacting horses sometimes develop outward symptoms of glanders, during a course of ordinary doses of mallein, after they have been tested even half a dozen times.

Mercury.

Biniodide of Mercury

is chiefly used in the form of absorbent ointment, which is usually made as follows:—

Biniodide of mercury	1 part.
Lard or vaseline	4 to 8 parts.

In hot climates, the amount of the vaseline or lard should be double that used in cold countries. The irritating effect of biniodide of mercury passes off quicker than that of cantharides.

Veterinary-Surgeon Desmond tells me that the addition of 5 per cent. of the hydrochloride of morphine to biniodide of mercury ointment, greatly diminishes the irritation which that application sets up.

Cadéac states that the antiseptic action of biniodide of mercury is 34 times greater than that of corrosive sublimate. He recommends its use in the following antiseptic solution:—

Biniodide of mercury...	1 part.
Alcohol...	200 parts.
Water	10,000 ,,

This solution has the advantage of not hurting the hands or instruments.

Mercury, Chloride of (Calomel),

is useful as an application for thrush; and to increase the purgative effect of aloes, for which object 60 grains of calomel may be given.

Mercury, Perchloride of (Corrosive Sublimate).

See p. 68. It is a deadly poison.

Nitrate of Mercury Ointment (Citrine Ointment).

The strong ointment, diluted with three or four times its weight of lard, vaseline, or lanoline, is a very useful application in cases of cracked heels and other inflammations of the skin.

Morphine (*Morphia*).

is one of the active principles of opium, which it resembles in its effects. A solution of from 3 up to 10 grains in extreme cases, may be injected subcutaneously.

Hydrochloride of morphine, sulphate of morphine, and acetate of morphine produce about seven times the effect of an equal weight of opium.

Nitrate of Potash (*Nitre*).

See "Potash, Nitrate of."

Nitre, Sweet Spirits of,

is a very useful medicine. It acts on the kidneys and skin, and is a good stimulant. Dose, 1 to 2 oz.; to be given in a pint of cold water.

Nux Vomica.

See "Strychnine."

Opium

in moderate doses, is a stimulant to the brain and spinal cord. In men and in dogs, opium is a soother of pain and a producer of sleep; but in horses, it is a general stimulant and a disturber of the functions of the brain, which action is particularly well marked, by the disordered movements of an affected horse. It checks the worm-like motion of the bowels; hence its use in cases of injury

to the abdomen. Horses can take large quantities of it—even up to an ounce—with impunity. See remarks on Indian hemp, p. 611.

An ounce of the tincture of opium (laudanum) contains 33 grains of opium.

Paraffin Oil

is used in parasitic affections of the skin, in thrush, and as an antiseptic (p. 68).

Potassium.

Potash, Bichromate of,

may be used internally for hastening the development of glanders (p. 501).

Potash, Nitrate of.

This salt, which is also called nitre or saltpetre, is a diuretic, and is given in doses of ½ to 2 oz. once or twice a day.

Potassium, Iodide of,

stimulates the glands and acts internally as an antiseptic (p. 127). Dose, ¼ to 2 oz. during the day. It may be dissolved in the drinking water, or mixed in a mash. When added to iodine or biniodide of mercury, it increases its solubility. It is useful, in the form of an ointment (1 to 6 of lard), as an absorbent application.

Poultices

are valuable as soothing applications, and also for cleansing wounds, in which case they should be always combined with a mild antiseptic (p. 67), because their warmth and moisture are particularly favourable to the development of putrefactive and infective microbes. They should be large, and should on no account be allowed to get dry.

For applying poultices to the feet, a poultice shoe, constructed as follows, may be used with advantage. Take a circular piece of hard wood, a little longer and broader than a horse shoe, and about 1½ inches thick. Get one surface of it rounded in a lathe, so that there may be a rise of about ¾ inch in the centre, while the other surface remains flat. Round the circumference of the board have leather nailed so as to form a convenient boot for retaining the poultice, and similar to the one in ordinary use, except that the part which comes on the ground is rounded. The fact of its

being round will enable the horse, to whose foot it is applied, to ease the affected spot by throwing weight on the toe, the heel, or on either quarter, as he chooses.

The best poultices for general use are those made with turnips, carrots, or linseed meal. Bran, though light and convenient, dries quickly, which defect may be remedied by adding a little linseed oil after mixing the bran with hot water.

To make a carrot or turnip poultice, boil a convenient quantity of these roots and then mash them up.

Bread Poultice.

Take a sufficiency of the crumb, place it in a basin, pour boiling water over it and cover it up for a few minutes. The water should be poured off and fresh boiling water added. It will then be ready for use. The change of water is made so as to get rid of the salts which are contained in the bread.

Charcoal Poultice.

"Wood charcoal, in powder	½ oz.
Linseed meal	3½ ,,
Boiling water	½ pint.

Add the linseed meal to the water, and stir them together, so that a soft poultice may be formed. Mix with this, half the charcoal, and sprinkle the remainder on the surface of the poultice" *(Tuson).*

Linseed Meal Poultice

"Linseed meal	4 oz.
Olive oil	½ ,,
Boiling water	½ pint.

Mix the linseed gradually with the water, and then add the oil with constant stirring" *(Tuson).*

Prussic Acid

is used externally to allay irritation of the skin (p. 152).

Quinine

is very valuable for checking the hurtful action of disease germs (p. 448), and also during recovery from a debilitating illness. It might be tried in two-drachm doses, twice a day, with a drachm of tincture of iron in a pint of water; or it may be given in a ball without the tincture of iron. Quinine, by itself, will require

the addition of a little acid, sulphuric for instance, to make it dissolve in water. Tincture of iron contains a certain amount of free nitro-hydrochloric acid.

Sal-ammoniac.

See p. 541.

Sodium.

Soda, Bicarbonate of (Baking Soda),

corrects acidity of the stomach; allays in a marked manner irritation of the mucous membrane of the intestinal canal; and assists the liver in purifying the blood. Dose, 2 oz. daily in the food. It also acts as an antiseptic (p. 68).

Soda, Hyposulphite of,

is given internally as an alterative and antiseptic.

Spirits.

Brandy and whisky, may be given in ¼-pint doses, mixed with water. We should remember that when stimulants are given to keep up the strength in wasting diseases, they should be used only to improve the appetite. If they fail in this, they should be discontinued; for any apparent improvement in the strength will be obtained at the expense of the tissues.

Steel, Tincture of.

See "Iron, Tincture of."

Stout.

See "Ale."

Strychnine

is one of the active principles of nux vomica. One grain of the hydrochlorate of strychnine, dissolved in 100 parts of water, may be injected subcutaneously.

Nux Vomica

is a valuable nervous stimulant, tonic, and bitter. Horses will eat it if mixed in their food. Strychnine, as I have just said, is its active principle. Dose, ½ to 1 drachm once or twice a day.

Sulphur

is useful in the form of sulphurous acid, for fumigating a building. The doors and windows should be closed, and four or five shovelfuls of burning coal placed inside it in convenient positions. On each shovelful of coal about ½ lb. of sulphur should be thrown, and the fumes of the sulphurous acid allowed to fill the building for at least twelve hours.

Candles containing sulphur and also corrosive sublimate are made by wholesale chemists, and are very useful and convenient for disinfecting purposes.

Tannoform,

which is a compound of tannin and formic aldehyde, is an admirable dry antiseptic dressing, especially for wounds which have a broad surface; and it rapidly produces a dry scab, in which respect it is far superior to iodoform. A solution of it in methylated spirit can also be used. It is a valuable agent in the treatment of diarrhœa (pp. 428 and 430). When given by the mouth, it passes through the stomach unchanged; and, when it reaches the small intestine, it breaks up into tannin (an astringent) and formic aldehyde (an antiseptic). These components are particularly active in their respective functions.

Tartar Emetic

seems, when given internally, to stimulate the glands of the skin. the appearance of which it consequently improves. It is a valuable worm medicine (p. 400). It is also used to increase the action of aloes. Such large quantities as 1 oz. or more, administered daily for several days, have been borne with impunity. As a rule, about ¼ lb., given at one time, will kill a horse; 15 grains a man; and 5 grains, a dog. Dose, 1 to 2 drachms daily in the food.

Turpentine

may be given internally, as an astringent, in 1 oz. doses three times a day. For destroying worms in the intestines, it should be given in full doses of, say, 4 oz. In doses of 2 oz. it is very useful in cases of flatulent colic. When given internally, it should always be combined with linseed or other sweet oil or with gruel, so that it may not injure the mucous membrane of the mouth, gullet, etc. It is an admirable antiseptic (p. 68).

Vaseline.

For making up ointments, vaseline has the advantage of not being affected by the air. But for this purpose it is not as good as lard, for its melting point is lower, and it is apt to spread and leave the agent, of which it is the vehicle, to dry upon the surface of the skin. By itself, it is useful in skin dieases.

Zinc.

White Lotion.

Sulphate of zinc	...	of each two drachms.
Acetate of lead ...	...	
Water	...	1 pint.

Is a useful application to wounds.

Zinc, Chloride of (see p. 68).

Zinc, Oxide of,

is used in powder, as an astringent, for sores; or in the form of ointment (1 to 8 of benzoated lard) as an application for cracked heels, etc.

Addenda.

CHLORAL HYDRATE (p. 604) when given by itself in sufficiently large quantities to produce insensibility, is dangerous. To obviate risk in this case, Cadéac and Malet advise a subcutaneous injection (p. 633) of 15 grains of morphine hydrochloride, followed ten minutes later by an enema of about 3 oz. of chloral hydrate in water mixed with a little gum.

IODISED PHENOL is an admirable antiseptic and caustic. It is made by rubbing 1 oz. of iodine and 4 oz. of pure carbolic acid, at a gentle heat, until dissolved.

CHAPTER XXVIII.

Administration of Medicines.

DIFFERENT METHODS AND RESPECTIVE PROPORTIONS OF MEDICINES—BY THE MOUTH—BY THE RECTUM—BY SUBCUTANEOUS (HYPODERMIC) INJECTION—BY THE WINDPIPE—BY PUNCTURE INTO THE LARGE INTESTINE—BY A VEIN—BY THE SKIN—BY THE MUCOUS MEMBRANE AND CORNEA.

Different Methods and Respective Proportions of Medicines.

In order to produce a general effect, medicines are usually given to horses by the mouth, rectum, subcutaneous tissue (tissue immediately below the skin), and windpipe; and occasionally by a vein, and by puncturing the large intestine. As a rule, medicines are administered locally, by application to the skin, mucous membrane, cornea, and subcutaneously.

According to M. L. Guinard, the effect of the active principle of a medicine in solution, when given by the rectum, is two or three times; when given subcutaneously, seven or eight times; and when given by the windpipe, from fifteen to twenty times greater than when given by the mouth. Consequently, the respective doses should be proportionately diminished. We may assume that the rapidity of absorption is approximately proportionate to the effect produced; supposing that the solution is at the same temperature in all these cases. Cold solutions are absorbed much more slowly than warm ones, the temperature of which should not be much above blood heat, say not over 105° F.

By the Mouth.

This is the usual way of administering medicines to horses, because it is simple, easy of execution as a rule, and because it is the best method for the absorption of oily and solid agents. Al-

though the mucous membrane has little power of absorbing oil, in its ordinary state, the absorption of this substance is readily accomplished, after the bile and pancreatic juice have acted on it. The solution of solid bodies is greatly facilitated by their meeting a large amount of water during their passage through the alimentary canal.

THE CHIEF WAYS OF GIVING MEDICINE BY THE MOUTH are as follows:—

1. *In the food or drinking water*, supposing that the medicine has not a disagreeable taste.

2. *As a powder* placed on the tongue.

3. *As an electuary*, which is a powdered medicine mixed up into a soft mass with honey, sugar, treacle, or mucilage. It is placed in the animal's mouth, so that he may gradually swallow it.

4. *As a ball.*

The method of preparing a horse for aloes has been described on page 599.

Before giving a ball we should see that the horse has a head collar or halter on him, and should get an assistant to stand by the near shoulder and hold the animal's head up, while he has the leading rein in the other hand (Fig. 152). The ball may be held between the four fingers of the right hand, the tips of the first and fourth being brought together below the second and third, which are placed on the upper side of the ball; thus making the right hand as small as possible, so as to admit of its ready insertion into the mouth. The left hand grasps the horse's tongue, gently pulls it out, and places it on that part of the right side of the lower jaw which is bare of teeth. The right hand carries the ball along the tongue and leaves it at the root. The moment the right hand is withdrawn, the left hand should carry the tongue to the middle line of the mouth and immediately release it, so as to bring the ball still further back. If the tongue is released while it is on the right side of the mouth, it will probably send the ball between the left molars. The operator then closes the mouth and looks at the left side of the neck, in order that he may note the passage of the ball down the gullet. Many horses keep a ball in the mouth for a considerable time before they will allow it to go down. A mouthful of water, or a handful of food, will generally make the animal swallow it readily. If this does not succeed, the nostrils may be grasped by the hand and held for a few seconds.

If the operator has not had much experience in giving balls, he should station an assistant on the near side to aid in opening and steadying the mouth, by placing the fingers of the left hand on the lower jaw, and the thumb of the right on the upper jaw. Holding

the mouth in this manner facilitates the giving of the ball, and saves the operator's right hand, to a great extent, from becoming lacerated by the horse's back teeth, to prevent which occurrence it is advisable to have a glove on the right hand.

The BALLING IRON (Fig. 153) is an instrument for keeping the mouth open. Its name appears to indicate that it is used for the purpose of giving balls, but it is rarely employed for that purpose; for the ball, before the instrument could be removed, would be liable to fall out of the mouth. It is very useful, however, when an examination of the mouth or upper portion of the gullet or

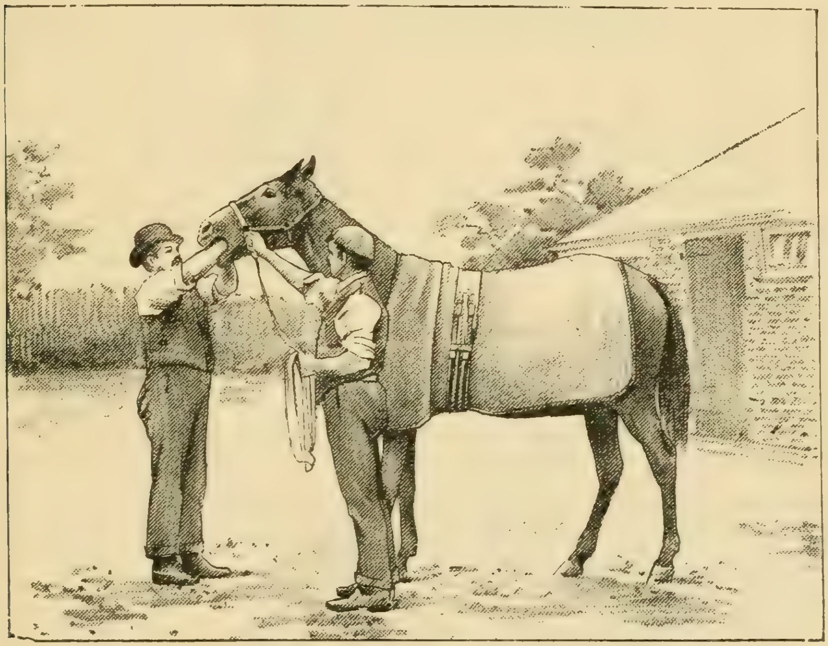


Fig. 152.—Giving a horse a ball.

windpipe has to be made. A curb bit with long cheeks will prove a fairly efficient substitute for a balling iron.

A BALLING PISTOL (Fig. 154) is useful for giving balls to fractious animals; to those (like young horses) which are very narrow between the two rows of the back teeth of the lower jaw; or to horses affected with some dangerously contagious disease, such as glanders.

We can make an effective balling pistol by taking a piece of india-rubber tubing of convenient length and of slightly greater diameter than that of a physic ball, and fitting into it a rounded stick which will work freely in and out of it, and which will be

a little longer than the tube. The stick should be flat at one end, and should be provided at the other end with a transverse piece of wood or other substance which will prevent this end from being pushed through the tube. Having withdrawn the guarded end of the stick two or three inches out of the tube, we insert the ball into the other end, which we put into the horse's mouth, and push the ball forward by the thumb, from the guarded end.

5. *As a drench.*

The usual way to give a drench is as follows: Raise the horse's head so that the line of his lower jaw is horizontal, or inclined slightly upwards. If he be quiet, an assistant on the near side should hold his head up with his hands; but if he be fractious, his head can be kept in position by means of a loop or cord of sufficient length passed under his upper jaw, and resting on the palate at the space which is bare of teeth (the interdental space). It is convenient to run one of the prongs of a stable fork through the upper end of the loop, and to give the handle to an assistant to hold; though it is better to have a staff with a loop of cord passed through it at one end, made for the purpose, than to employ a sharp-pointed instrument near the animal at a moment when he may be apt to struggle.

The person who gives the drench should stand on the off side, and should introduce the bottle, or other vessel which holds the medicine, into the mouth just in front of the grinders, at the space which is bare of teeth, and should direct it well back. Only a little at a time should be given, say, one or two wine-glasses full, and ample time should be allowed the horse to swallow the fluid. If he makes the slightest effort to cough, his head should be instantly lowered, so that the fluid may not go the "wrong way." His tongue should on no account be drawn out of his mouth and held, and his nostrils should not be grasped with the hand; for a sudden gasp for breath might carry the fluid into the windpipe, and consequently set up inflammation of the lungs.

The mouth of the drenching vessel should be broad, so that the fluid may readily escape. An ordinary glass bottle is bad; as its neck is narrow, and it is apt to break and hurt the mouth, unless it be covered with leather. A wide and smooth mouthed block-tin vessel, containing about a pint and a half, fulfills its purpose.

Even with the greatest care, the foregoing method of drenching is sometimes attended with disastrous results, on account of the liquid going the wrong way, because the head is held in an abnormally high and extended position.

A French way of drenching is as follows:—Put the drench into a syringe, close the animal's mouth by means of a noseband, place the pipe of the syringe between the bars of the

animal's mouth on one side, and slowly inject the drench. The portion of the fluid which is not swallowed, is received in a

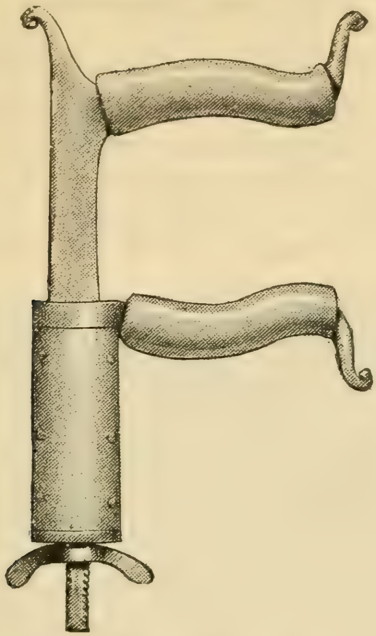


Fig. 153.—Balling iron.

bowl held by an assistant, and is taken up by the syringe, and again injected.

Bouley and Goubaux have shown by experiments, that drenches

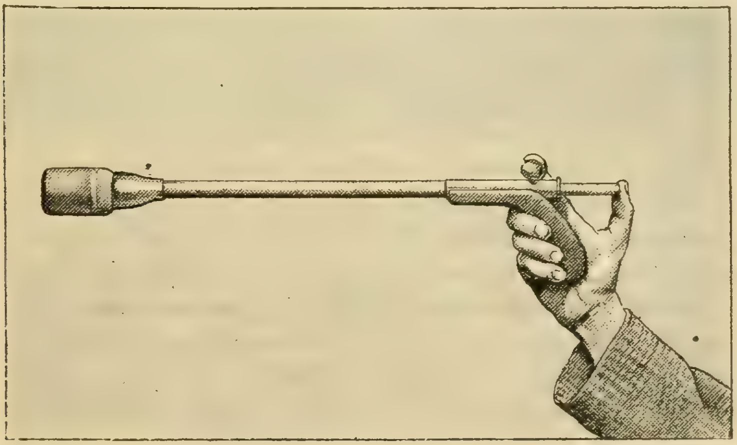


Fig. 154.—Balling pistol.

given by the nostrils, go into the windpipe eight times out of ten, and consequently this method of drenching should not be employed.

By the Rectum.

In this country, these injections (enemas or clysters) are generally used only for the mechanical relief of constipation by means of warm water, or for destroying worms by, for instance, oil of turpentine mixed with linseed oil. For this purpose, a Read's enema pump (Fig. 155) is frequently used. The value of an injection of this kind in constipation is enhanced by the fluid being sent a good distance into the bowel.

There is no doubt that an enema given in the ordinary way is almost useless; because the injected fluid does not penetrate more than four or five feet into the bowel. Colonel Fred Smith has devised a good form of enema tube, which is 6 ft. long, and may be used with Read's enema pump. He remarks that "there is no difficulty in passing it; having been oiled, with gentle pressure, it finds its way along the course of the rectum, and when it refuses to go further no force should be used; all that is required, should it be necessary to pass it further forward, is to pump in a gallon or two of water, which dilates the bowel in front of it, and the passage is accomplished." A simpler and probably a better plan is that of having the hind quarters raised while the enema is being given, as advised by Mr. Rutherford (p. 423).

Water for enemas should be but little warmer than the temperature of the body, say, not more than 103° F. It should not be mixed with soap or any other addition.

An assistant holds up the near fore foot. The operator having filled the clyster pipe and oiled its nozzle, inserts it very gently into the anus. The fluid is then injected.

Contrary to what is usually thought, the rectum has great power of absorbing water, as we may learn from the fact, pointed out by M. L. Guinard, that it is the place in which the dung assumes its normally dry condition. Hence, it is a valuable route for the introduction into the system of medicines which are dissolved in water. To facilitate absorption by this means, the dung in the rectum should be cleared out by back-raking (p. 638), and the solution should be of small bulk. Unlike the mucous membrane of the mouth, the mucous membrane of the rectum does not excrete sufficient fluid to dissolve ordinary dry medicines, which consequently should not be given in the way. Also, its power of absorbing oils is feeble. When injecting a small quantity of fluid, say, about 1 oz. into the rectum, it is well to use a narrow tube with the syringe, or a catheter made according to Veterinary-Surgeon Desmond's design (p. 656) might be employed. This

method of injection is not suitable to cases in which the mucous membrane of the intestine is in a state of irritation (Guinard).

By Subcutaneous (Hypodermic) Injection.

In this way, exactness in the amount of the dose can be insured better than by the mouth or rectum. With "difficult" horses, it is often easier to make a subcutaneous injection, than to give a ball or drench. This method is frequently indispensable for producing local effects, as, for instance, with cocaine (p. 608), in which

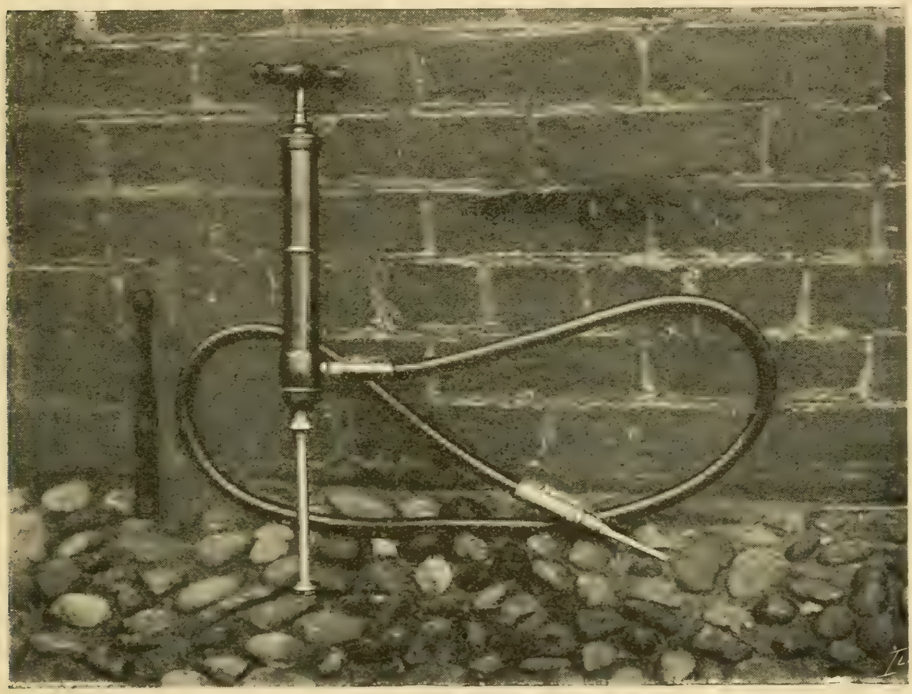


Fig. 155.—Read's Enema-Pump.

case the injection is made deeper than usual, or it is made close to the nerve on which it is required to act. Medicines given hypodermically do not come in contact with the food in the stomach and intestines; and they "escape the changes which many substances undergo in the liver, and hence act more certainly" (*Finlay Dun*). Economy in drugs is a further item for consideration. The chief disadvantage of this method is that it is not suitable for certain medicines, such as oily substances, which are very slowly absorbed by the subcutaneous tissue; bulky agents, like Epsom salts; and irritating drugs, like turpentine. The bad effect due to the introduction of putrefactive material into the wound can be entirely obviated by strict antiseptic measures (p. 70).

MEDICINES FOR HYPODERMIC INJECTION AND THEIR DOSES.—"The drugs most suitable for subcutaneous injection are liquids which can be mixed with water, and soluble solids, particularly alkaloids. Distilled water is the best vehicle, and after it, alcohol and glycerine, properly diluted" (*L. Guinard*). The solutions should be neuter in their reactions, or only slightly acid; free from solid particles and all impurities; and as concentrated as the nature of the medicine will admit, so that absorption may not be retarded. Druggists issue medicines for hypodermic injection in exact doses in hermetically closed tubes, and in tabloids of particular weights.

Guinard ("Encyclopédie Vétérinaire") gives the following strength for hypodermic injections:—

Aloin, 10 to 20 p.c.
Cocaine, 2 to 5 p.c.
Eserine, $\frac{1}{5}$ p.c.
Salts of morphine and pilocarpine, 2 p.c.
Strychnine, $\frac{1}{10}$ p.c.

THE OPERATION AND ITS SEAT.—These injections are made by a syringe (Fig. 156) which has a glass barrel and a hollow needle. The most suitable substance for the manufacture of the needle is an alloy of platinum and iridium, which is hard, rigid, and practically indestructible. It is well to have the piston of asbestos, so that the syringe can be rendered free from putrefactive germs by immersing it for a few minutes in boiling water, which in this case will not injure it. In order to prevent the introduction of putrefactive or infective material under the skin by this operation, we should, if possible, do it under antiseptic precautions (p. 70), that is to say, we should disinfect the part, our hands, and the syringe, and should take care that the solution for injection is free from contamination. For producing a general effect, it is advisable to choose a spot where the skin is thin and loose, so that the puncture may be easily made, and the injected fluid may have plenty of room to become widely distributed. On this account, these injections are generally made behind or in front of the lower part of the shoulder, or on the breast. After the syringe has been filled, it should be held with its point uppermost and the piston slightly pressed, to permit the escape of the bubble of air which might otherwise remain; because the entrance of air under the skin might give rise to an abscess. A more or less horizontal fold of skin, at the spot chosen, is taken up between the finger and thumb of the left hand, and the point of the syringe, which is held in the right hand, is passed perpendicularly through the base of the fold, and is carried a little onwards, between the skin and the flesh, which we

should avoid hurting. The fluid is gradually forced out by the pressure of the right thumb, and the syringe slowly withdrawn. The first finger of the left hand is then placed on the orifice, to prevent the fluid escaping, and the part which contains the fluid is gently rubbed with the right hand, so as to hasten absorption. It is sometimes more convenient to disconnect the needle from the syringe, insert it, and then screw on the nozzle, than to make the puncture with the needle attached to the piston. If, while injecting, we see a bubble of air in the piston, we should avoid injecting it, by taking care not to press the piston "home."

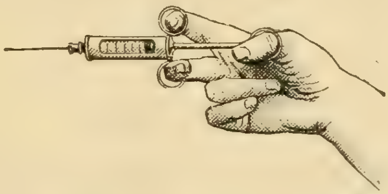


Fig. 156.—Hypodermic syringe.

By the Windpipe.

According to this (intra-tracheal) method, the medicine is injected by the syringe through an opening in the windpipe. The puncture should be made well away from the larynx, and in the space between two adjacent cartilaginous rings of the windpipe, and is generally effected by a curved trocar and cannula. On removing the trocar, the nozzle of the syringe is fixed to the cannula, the end of which should point downwards. The mucous membrane of the windpipe is not very sensitive, probably on account of its great power of absorption. The amount of solution may vary from ¼ to 1 oz., and the fluid should be slowly injected, so as not to interfere with the breathing. The nature of the fluid and the precautions as to cleanliness are similar to those in subcutaneous injections. "Beyond a slight gain in time, intra-tracheal injections, other than those intended to act locally, have no advantage over hypodermic injections (*Finlay Dun*). This statement does not hold good with respect to quinine, a solution of which is readily absorbed by the windpipe and without producing irritation, which it is apt to do if injected subcutaneously. Veterinary-Surgeon Desmond, who has had a very large experience in the administration of eserine to horses, greatly prefers to give it intratracheally than subcutaneously.

By Puncture into the large Intestine.

The bowel is first punctured by a trocar and cannula, and when the trocar is withdrawn, the medicine is injected into the cannula, which conveys it into the intestine. We must observe the precaution "that the cannula is still in the bowel when the solution is injected. This is shown by a small amount of gas being expelled with each respiratory movement" (*Bradley*). If the solution, instead of flowing into the bowel, falls into the abdominal cavity, death may ensue from peritonitis (p. 114). The danger of this accident naturally decreases the popularity of this operation.

By a Vein.

This (intra-venous) method of injection is very rarely practised by veterinary surgeons, but it will certainly be widely adopted in the near future, on account of its great value in directly attacking infective agents in the blood, such as those of septicæmia (p. 532). Strict antiseptic precautions (p. 70) should be observed, and great care should be taken to avoid the formation of blood clots and the introduction of air into the vein. Blood clots might form a thrombus (p. 118), and air carried into the heart might easily kill the animal. A small incision into the skin at the seat of operation may be necessary to facilitate the introduction of the needle, and we should be particularly careful to keep the point of the needle in the centre of the blood-vessel, and not to pierce its other side. We should, of course, bear in mind that the blood stream in a vein proceeds towards the heart. The jugular vein (p. 118) is the most convenient one to operate on. The injection should be made very slowly, and its effects should be carefully noted. It is well to remember that some medicines, as, for instance, Epsom salts and Glauber's salts, do not have the same action when injected into a vein as they have when taken by the mouth.

By the Skin.

When the skin is in a normal condition, its power of absorption as a rule is almost nil; but when it is inflamed, it can readily take up the active principles of many medicines, as we may see by the irritating effect which extensive cantharides blisters, applied to the legs, have on the kidneys. The antiseptic action of biniodide of mercury on the microbes of pus in more or less deep-seated tissues,

when applied to the skin in the form of ointment, with friction, is well shown by the manner in which it checks the formation of abscesses in strangles (p. 470) and joint-evil (p. 535).

By the Mucous Membrane and Cornea.

The chief medicines given in this way are cocaine, for deadening pain; and atropine, for dilating the pupil of the eye.

CHAPTER XXIX.

Operations.

Backraking

is the act of unloading the back part of the intestines. It is chiefly resorted to when the horse has been given physic without having been previously put on mash diet, and for unloading the bowels in cases of colic and constipation. Before performing this operation, the arm and back of the hand should be well oiled, and all unnecessary violence should be avoided.

Bandaging.

See pages 45 and 49 to 51.

Bleeding.

In order to produce a general effect on the system, a horse can be bled from either the right or left branch of the jugular vein. These branches respectively lie in the groove which may be seen just above the windpipe on either side of the neck. If the vein be pressed by the points of the fingers, the portion of it which is above the part pressed, will become distended with blood, and the course of the vein will become clearly defined (Fig. 43, p. 119). A point about ten inches from the angle of the jaw may be selected as a convenient spot from which to bleed, and it is well to adopt antiseptic precautions (p. 70).

An assistant should hold the horse's head up, so that the vein and the skin which covers it should be somewhat stretched and pressed together. The horse should be placed in such a position that the vein will be clearly defined; and should be prevented from seeing the operation by blinkers, by a cloth attached to the head-stall of the bridle, by the assistant placing his hand over the eye of the side on which the animal is to be bled, or by some other ready means.

As the branches of the carotid artery lie close under those of the jugular vein, it is safer to use a fleam than a lancet for bleeding, unless a guarded lancet, made for the purpose, be employed.

The near side is the more convenient one of the two, for a right-handed man, on which to bleed with the fleam. As blemishes, however, are less likely to be noticed on the off than on the near side, the former may be selected in the case of a valuable animal. The cutting portion of the fleam should be broad, so as to obtain rapid depletion, which produces a much better effect than when the operation is prolonged; the amount abstracted being the same in both cases. The blade should be clean, sharp, and smooth, so as not to injure the vein unnecessarily.

The spot having been selected, the skin immediately above it should be smoothed down with a damp sponge.

The operator should open the fleam so that its back should be at a little more than a right angle with the handle. He should hold the joint of the instrument with the tips of the index finger and thumb of his left hand, and should allow the handle to rest on the space between the finger and thumb. If there be a second assistant, he should press the vein, in order to make it more clearly defined; but if there be no one to help, the operator should, by pressing his fingers on the vein, assure himself of its exact position. Having ascertained this, he should place the cutting edge of the fleam in the centre and along the course of the vein, but not across it; for a longitudinal incision will give a more copious flow of blood than a transverse one, which might destroy the continuity of the vein. He should then take the blood-stick (which is purposely made short and heavy) in his right hand, and should strike the back of the fleam a sharp measured blow with it, at a point just above the cutting edge. On removing the fleam, a jet of blood will flow out, if the operation has been properly done. If, however, the flow of blood be slight or altogether wanting, the non-success may be due, either to the vein not having been punctured, or to the opening in the skin not corresponding to that made in the vein, owing to the position of the head having been shifted. The operator may satisfy himself on the first point, by compressing the vein a little below the incision; and, on the second point, by bringing the head back to the position it occupied when the fleam was struck. If the blow has been too light, although the fleam might have been held correctly, a second incision may be made at the same spot, or a little above or below it. It is the safer plan, however, to make a second attempt on the other side.

When an opening is to be made in the right vein, the operator, before striking, may cause it to become distended by pressing it

with the second, third, and fourth fingers of the left hand, while the index finger and thumb hold the fleam.

When the blood begins to flow, the part of the vein just below the incision should be pressed with the fingers in order to prevent the blood accumulating in the loose tissue underneath the skin. The movement of the horse's head should be restricted as much as possible.

The blood should be received into a measure, so that the amount abstracted can be ascertained at any moment, and care should be taken that the vessel which receives the blood does not press against the vein.

Bleeding to the extent of three or four quarts will be sufficient in ordinary cases.

When enough blood has been taken away from the animal, the operator should place a finger on the orifice, and should then gradually remove the fingers which were engaged in pressing the vein just below the incision. If this precaution be neglected, the horse will run the risk of being killed by a sudden rush of air into the vein on the compression ceasing abruptly. When the air, in this case, enters the vein, it is carried to the right side of the heart, where it is churned up into froth, so that the heart is unable to send a due supply of blood to the lungs; the result being that the animal dies from suffocation.

In order to close the wound, the operator should press the edges together with the thumb and index finger of his left hand, taking care not to pull them towards himself, lest a tumour of infiltrated blood may form underneath the skin. He should also press the finger and thumb lightly against the neck, in order to steady the part. A pin held in the fingers of the right hand should be passed through the centre of the edges of the wound; and some cotton or tow should be wound round the ends of the pin in the form of a figure of 8, and knotted. The head of the pin is pushed down, and its point cut off so that it may not catch on anything. The pin may be removed after a week's time.

Blistering.

The hair should be closely clipped or shaved off the part to be blistered, and the ointment should be rubbed into the skin for ten minutes or a quarter of an hour. The longer the rubbing is kept up, the greater will be the effect. The horse's head and tail, if they can reach the blistered part, should be tied up. If the blister does not "rise" next day, some more of the application may be rubbed on, or the effect of a little friction with the hand may

be tried. After two days, the part may be bathed with warm water, and some sweet oil smeared over it.

Mares "in season," horses inclined to dropsy, and those which are in a debilitated state, or are shedding their coats, should not be blistered; for in such cases the part is apt to swell enormously, and its skin to slough. These untoward symptoms are liable to ensue after blistering in hot climates during the rainy season. In such cases, a mild dose of physic—a pint of linseed oil for choice—may be given; or if the animal is weak, and is consequently in an unfit condition to stand purging, half an ounce of nitre may be mixed in his drinking water for a few days. A liniment of equal parts of Goulard's extract and sweet oil can be applied to the part.

Mr. Harold Leeney, M.R.C.V.S., tells me that an "unnerved" (p. 669) leg should on no account be blistered; for a blister in such cases, often gives rise to gelatinoid degeneration (shown by swelling and softening) of the tendons and ligaments of the part, from an inch or so above the blister downwards.

Casting a Horse.

The usual methods for casting a horse are: by ropes; and by hobbles. The former is the better of the two for castration, removal of scirrhous cord, and operations for hernia; as the hind legs can be kept wider apart by it than by the latter, which is more convenient for all other operations. A piece of soft old grass land is, in every respect, the most suitable place on which to cast a horse. A ploughed field, sandpit, or, failing these, a bed of straw will also do. With ropes used in the ordinary manner, straw should not be generally employed, as it is impossible to tell within a few feet where the horse will fall; but with well-managed hobbles, or according to Mr. Over's plan, he can be made to drop on the very spot on which he had previously stood. As a rule, a twitch should be put on before the horse is cast. As horses are liable to fracture their backs in this operation, we should be very careful about casting animals which appear stiff in their backs; especially old ones.

The following are useful ways for casting horses.

1. By *ordinary side lines.* The casting rope is thick, soft, about 20 yards long, and provided with two metal eyes, at equal distances from its centre, and about 30 inches apart from one another, so as to form pulleys for the rope. The usual method is to knot the rope, so as to make, at its centre, a loop which will fit, when passed over the animal's head, like a collar round the base of the neck. The knot is placed uppermost, in line with the withers; and each end of the rope is passed backwards between the hind legs, brought

round their respective pasterns, and then passed through the eye of the improvised collar at its own side. The horse's head being steadied by a twitch, two assistants, one on each side, pull on the ropes, and thereby draw his hind legs forward; when a push or a pull on the tail is all that is needed to throw him on his side. An extra turn of rope is taken round the pasterns, so as to prevent the hind feet getting loose. The ropes are tightened and the animal fixed securely, with his hind legs drawn closely to his sides, and well separated, so as to freely expose the testicles and the under surface of the belly. If the loop of the rope presses unduly on the windpipe, it should be pulled away from that part, or the uppermost hind leg may be drawn forward, which will also relieve it. It is well to put bandages on the hind pasterns to prevent them being cut by the rope. Instead of the foregoing method, I prefer to take a rather thin, though strong and flexible, rope, and two iron rings about 2½ inches in diameter, which I include in the knot forming the collar (Fig. 157). To prevent the rings getting out of place, I make with the rope another knot behind them. The knot of the collar (and rings), as in the first method, is placed near the withers (Fig. 158), and the ropes, instead of going over the hind pasterns, are passed respectively through rings on hobbles which have been previously put on the hind pasterns (Fig. 159). The employment of these hobbles, which are lined with felt, allows the ropes to run freely and obviates all risk of their cutting the animal's hind pasterns.

In all cases, when on the ground, the horse's head should be kept down, and his muzzle well extended. If, when using the casting rope, we want to operate on one of the fore legs, we may, after having thrown the animal, strap up the other fore leg, by its pastern, to a surcingle which had previously been put on.

Care should be taken that the horse is not tied up too tightly, lest, during his endeavours to free himself, he may fracture one of the bones of his back or limbs.

Mr. Reginald Over has designed an admirable spring hobble (Fig. 160) to be used when casting horses. Its special advantage is that it can be readily slipped over the pastern, without having to buckle it. It is made by Mr. Huish, 12 Red Lion Square, London W.C.

2. By *side lines, according to Mr. Over's plan.* Supposing that the horse is to be cast on the near side, place him on the selected spot; have him held by a man, who should stand in front of him; and put Mr. Over's spring hobbles on the off fore and on both hind pasterns. Take a rope about 8 yards long with a short loop round one end, and by the aid of this loop, make a collar with the rope round the animal's neck; the knot being on the off side

of the shoulders (Fig. 161). Pass the free end of the rope through the hobble on the off hind; bring it through the collar round the neck; and give it to a man, who should stand on the near side of the horse and a little behind him. Attach another and similar

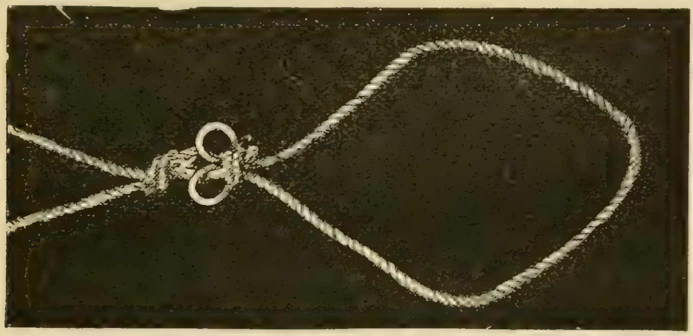


Fig. 157.—Improvised casting rope.

rope to the near fore pastern (preferably by a small loop); pass its free end through the hobble on the near hind; bring it outside the animal's off fore; and hand it to a man, who should stand a little in front of the horse, and on the off side (Fig. 162). The

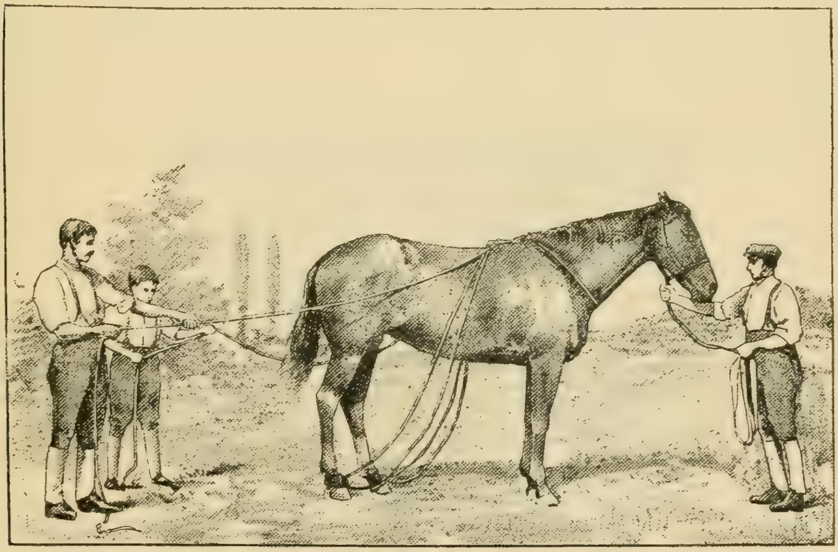


Fig. 158.—Horse ready to be thrown.

man holding the front rope (aided, if possible, by a fourth assistant) then takes a strong and steady pull on it, with the result that the animal's near hind is raised off the ground and pulled forward, and the horse drops quietly down, with his near hind quarter first

touching the ground, especially if the man behind him gives his tail a pull to the near side. When the horse falls, the rope which has been passed through the hobble on the near hind, is now passed through the hobble on the off fore; is pulled tightly so as to bring the two fore feet and the near hind foot together; and is secured round one of the pasterns. The other rope is then pulled so as to draw up the off hind foot; and is fastened to the collar. If necessary, its free end can be passed over the off hock (as in Fig. 163), so as to prevent the animal from straightening his off hind leg. The great advantage of this method is that the horse falls on the spot upon which he stood.

3. By *hobbles*, which, in their simplest form, are four strong leather straps that are buckled to the pasterns. Each of them is provided with an iron D for a rope or chain to pass through. One, called the "main hobble," has a larger D than the others.

To cast a horse on his right side, pass a loop of soft rope or webbing over the near fore leg, leaving the free end to hang over the animal's off shoulder. The main hobble is put on the near fore leg (or on the off fore if the horse has to fall on the near side), and the remaining three are put on the other legs, the buckles being on the outside. One end of a rope or chain is made fast to the D of the main hobble, its free end is passed through that of the hind leg on the same side, and so on until it returns through the D of the main hobble again. Two assistants hold this rope or chain, while one seizes that which passes over the shoulder. A steady pull on the hobble rope will bring all four feet together, and one on the shoulder rope will serve to throw the horse on his side.

We may release one foot, for an operation, by simply undoing the buckle of that hobble. The horse in Fig. 163, has been cast by hobbles.

If, when the horse is on the ground, it is required, as for castration, to bring the uppermost hind foot forward, so as, for instance, to expose the testicles, a loop of soft rope or webbing should be placed over that leg just above the fetlock (Fig. 163). The free end should be placed over the withers, underneath the base of the neck, and should be brought over the loop, and underneath and round the gaskin (just above the hock) of the uppermost hind leg. It should then be brought across the belly of the horse, in an obliquely forward direction, and should be held by an assistant. Another assistant should catch hold of this rope (so as to be able to pull on it) as it comes up from underneath the base of the neck.

Before the horse is cast, his eyes should be covered with some convenient cloth, or with leather eye guards made for the purpose. At the moment of throwing him, an assistant should stand at his

head to steady it. When the horse is on the ground an assistant should hold his head down, and should keep his muzzle well for-

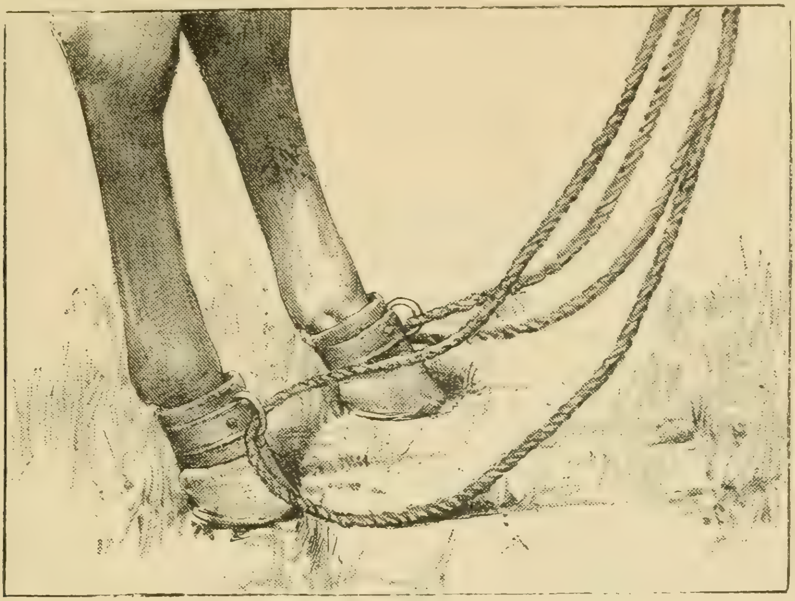


Fig. 159.—Special hobbles for casting.

ward. It is also advisable to keep his tail straight out. The fact of having the column of bones from his nose to the end of his tail

Fig. 160.—Mr. Over's spring hobble (registered).

in as nearly a straight line as possible, will deprive him, to a great extent, of the power of struggling violently in this position, which,

if he succeeds in doing, might not only be inconvenient to the operator, but might also be the cause of the animal seriously hurting himself. The horse should not be fixed tightly, and no "back rope" should be used to bind him; lest he may injure himself during his struggles. He should be kept fasting for five or six hours previous to being thrown.

An admirable and well-known plan for keeping a horse's head down after he has been cast, is to place over his neck, a sack half filled with sand, and tied round its middle with cord. The sack, by its weight, will prevent the animal from raising his head off the ground; and, by its employment, the presence of at least one assistant, can be dispensed with. It is compressed at its middle, so that it may conform to the shape of the neck.

4. The easiest way of throwing a horse for operations about the fore part of his body, or for giving him chloroform, is one which I have fully described in "Illustrated Horse Breaking," and which can be done by one man. It consists in tying up a horse's fore leg and pulling his head round to the other side. Fig. 164 shows a horse ready to be thrown in this way, with the necessary gear on him. My readers will observe that the fore leg which is tied up, is suspended from the surcingle. When the horse is made to lie down in this manner, the fore leg which has been free, can be strapped up by its pastern to the surcingle, so that both fore legs are secured (Fig. 165). By this method, a horse can be soon taught to lie down, by merely pulling his head round to his side.

One great advantage of this method is the power it gives us over the animal's head, in, for instance, operating on or examining his mouth, and in drenching him; for we can easily pull the head up and secure it with the rope (Fig. 166).

Castration.

EFFECTS OF CASTRATION AND GENERAL REMARKS.—The effects of castration on young entires are both mental and physical. This operation tends to make them quiet and to render their future conformation more or less similar to that of mares, which, in the course of time, do not become heavy in the neck and shoulders, like stallions. This muscular and fatty increase of weight of the forehand is undoubtedly the cause of entires not being able, as a rule, to retain their galloping and jumping powers, as long as geldings. The structural change in question is more pronounced in entires which are used for stud purposes, than in those which are kept at work. Cagny and Gobert state that this increased development of the forehand is accompanied by a corresponding "falling away" of the hind quarters, which is certainly

Fig. 161.—Mr. Over's method of casting for castration (off side view).

Fig. 162.— Mr. Over's method of casting for castration (near side view).

not the case among Arab horses that are used for riding and driving in India. The fact however remains, that castration has a powerful influence in preventing a colt from becoming heavy in front. If performed too early, it decreases the future development of the forehand too much, and also diminishes the animal's vigour, which fact, as regards working bullocks, is well recognised on the Continent. A long experience of Australian geldings of the Indian remount class, has shown me that many of them are too light in front and are lacking in energy, which fact Veterinary-Surgeon

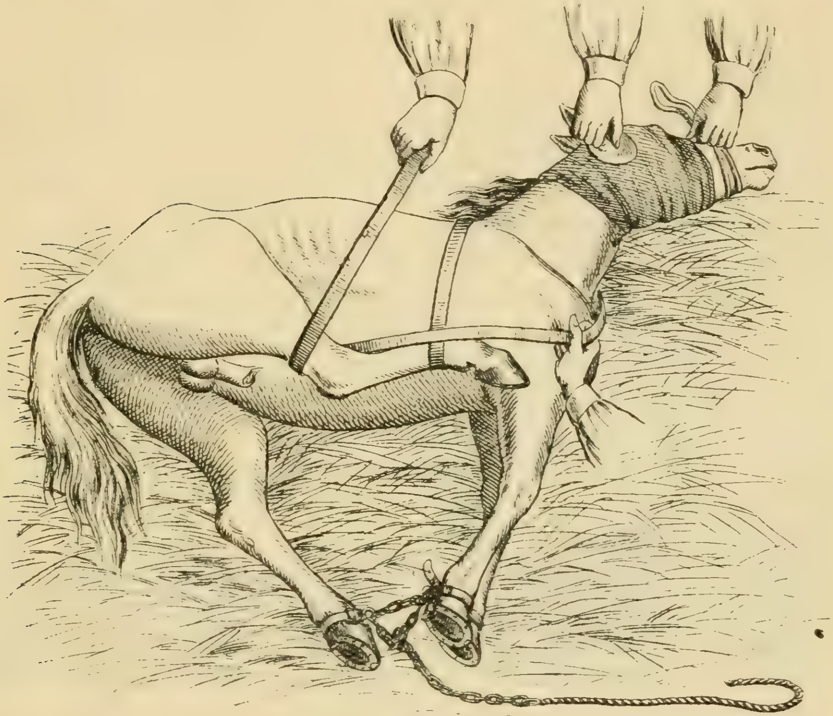


Fig. 163.—Drawing a hind leg forward. (Borrowed from Peuch and Toussaint's "Chirurgie Vétérinaire.")

Desmond has explained to me is due to the Australian custom of castrating ordinary colts at the early age of nine or ten months, so as to prevent them giving trouble at grass. Speaking generally, we may fix the age of castration between one and two years; and while working within these limits, we should be guided by the state of individual development.

The testicles of a colt do not usually descend into his scrotum, until he is from six to ten months old (Chauveau).

Under similar conditions, there seems to be as little danger in castrating an "aged" horse, as a colt; although the former is, of course, more liable to have his testicles or cord in a

diseased condition, which fact might render the operation difficult, or unsafe. The only special ill result to an old animal is that the operation is apt to cause him to lose his spirit and pluck, and to make him nervous or vicious. Operating under chloroform appears to aid in preventing this untoward contingency from occurring.

Colts intended for saddle and light harness work should be castrated earlier than those destined for heavy draught, which animals ought to be heavy in front, so as to be able to put weight into the collar.

A horse should be in good health and condition before being "added to the list," and should be previously stinted of food for five or six hours, so that he may not injure himself internally when struggling.

In order that the wound may not take on an unhealthy action, it is well not to castrate during cold or damp weather.

The operator should see that the surroundings are free from bad odours or taint of any kind, and it is advisable for him, before commencing, to disinfect his hands and instruments and the site of operation (p. 70). He should abstain from operating if he has recently been "calving" cows; making a *post-mortem* examination; or if he has been brought into contact with decomposing matter. These precautions are taken with special reference to the prevention of tetanus and scirrhous cord.

Before castrating a horse, he should be carefully examined for hernia, the presence of which will permit only of the covered operation being performed.

As a horse, during the time the sheath is swollen from the effects of castration, may have difficulty in "drawing his yard" to stale; it is well before the operation and after the horse has been cast, to insert one's hand into the sheath, clean it out with warm water, and freely anoint the inside of the sheath and penis with vaseline or sweet oil.

METHODS OF CASTRATING.—Those in ordinary use are as follows:—

1. *By the écraseur* (Fig. 113, p. 289). The animal should be on his left side, so as to allow the operator freedom to use his right hand. It is well to have a spare chain for the écraseur.

If hobbles are used, the horse should be thrown on his left side, and his off hind leg should be drawn forward in the manner shown in Fig. 163. The left testicle is taken in the left hand, and its base is squeezed, between the thumb and finger, so as to tighten the skin over it. If there be difficulty in catching hold of the testicle, the right hand may be used to aid the left. French veterinary surgeons advise that, in such a case, an assistant should

lightly tap the muzzle of the horse with a switch or whip, so as to distract his attention, or he might be put slightly under the influence of chloroform. To overcome the action of the cremaster muscle, we should push the testicle forward, but not draw it back. The left testicle being held in the left hand, fingers pointing to the rear, the operator should make, with a sharp and suitable knife, a bold cut, parallel to the middle line, of about four inches in length, through the skin and coverings of the testicle, which ought to spring out through the opening thus effected. While making the cut, the operator can steady his hand by keeping the tip of the

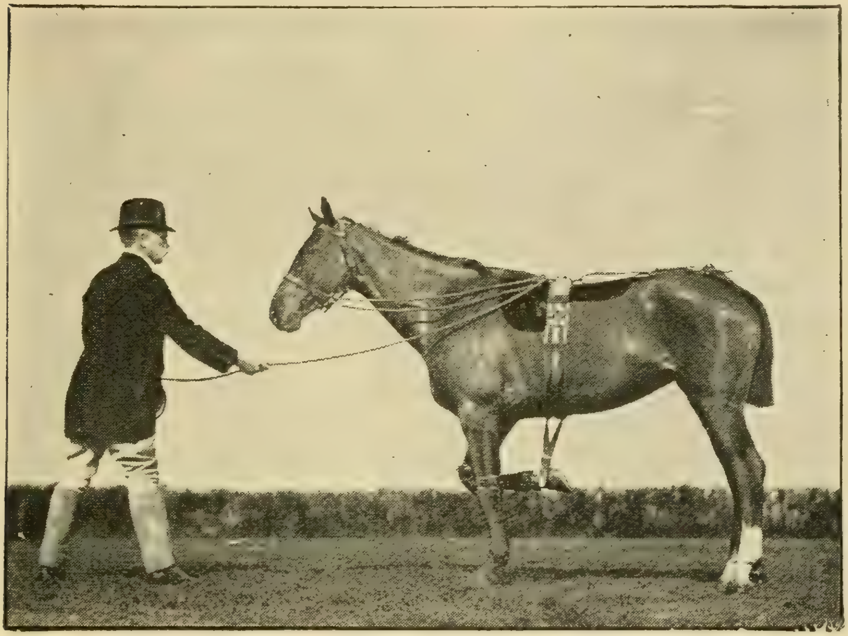


Fig. 164.—Horse ready to be made to lie down.

thumb on the testicle. If the incision does not prove deep or long enough, a second or third one may be made. The cut should be well forward, and as close as possible to the sheath without injuring it, so that any subsequent discharge may readily drain off. It does not very much signify if the testicle be wounded. The testicle in its natural state is covered by skin and by an inner coat (peritoneum), the surface of which, next the testicle, is smooth and glistening, as it is a serous membrane. This serous pouch in which the testicle lies, contains, in health, a greater or less quantity of watery fluid, which may squirt out when the incision is made. We may find, as a result of previous inflammation, the testicle adhering to its covering of peritoneum, which in such

a case will have lost its serous character, and will have become fibrous. If, on opening the scrotum, hernia be observed to be present, the covered operation (p. 654) should be performed. It may happen, especially in the case of old horses, that owing to previous inflammation the testicle adheres to the scrotum, and will not easily come out. If this occurs, the adhesions should be broken down by the fingers, or they may be carefully dissected away by any convenient blunt instrument. When handling the testicle we shall find as a rule, that it is at times strongly drawn up towards the abdomen by the cremaster muscle, the tendon of which we shall be able to distinguish, at the posterior part of the testicle, by its rigidity. We should divide this tendon by a touch of the knife, and may also, without danger of causing bleeding, cut away some of the bloodless portion of the cord at its posterior border, so as to clear the testicle for removal. We should here remember that the large blood-vessels of the cord are in front. We may now slip the chain of the écraseur over the testicle, and bringing it well down on the cord, wind it up by the handle, until the cord is severed. Care should be taken that the cord is not pulled upon in any way during the struggles of the animal. Having screwed up the écraseur to its full extent, we may find that the cord is not altogether severed, in which case, instead of pulling at the chain, it is safest to twist the testicle round and round with the hand until it comes off. Having removed the other testicle in a similar manner, we should wash out the cavity freely with water, and then with a solution in water of chinosol (20 grains to the pint), creolin or carbolic acid ($\frac{3}{4}$ oz. to the pint), or other suitable antiseptic (p. 67). If any omentum (p. 284) protrudes, it should be pulled up, cut off, and treated with the antiseptic lotion; for if it is allowed to hang down when the animal gets on his legs, it will soon become united to the wound in the scrotum, and will form an unhealthy tumour. The animal may now be allowed to get up, and should be kept on green food for a week. The wound, to keep off flies, may be smeared over, from time to time, with an ointment composed of creolin or carbolic acid and vaseline (1 to 30), powdered aloes and lard or vaseline, or turpentine and lard (1 to 4). Or the wound may be syringed out, every now and then, with a solution of chinosol, creolin or carbolic acid (p. 67).

After this operation, there is generally a little bleeding, which will soon stop of its own accord.

2. BY THE HOT IRON. The procedure by this method is the same as already described, up to the putting on of the chain, instead of which a clam is passed underneath the testicle and around the cord, close to the belly, and is secured by a ring which passes

over its handles, by a ratchet, or by a screw; the first being the simplest plan, though the third is probably the most efficient.

The clam is an instrument used for compressing the cord, and is composed of two pieces of flat steel, which have serrated edges and are united by a joint. The ends away from the joint are formed into handles. The clam should be made extra broad if it is to be used with the hot iron, in order that it may save the thighs from being burned.

If we cannot obtain a broad clam, the scrotum and inside of the

Fig. 165.—Horse on ground with both fore legs secured.

thighs should be protected from the heat by covering them with wet cloths. The operator should take a hot firing iron, which should be clean and free from all scales, and should burn through the cord and surrounding tissues at a distance of about half an inch from the clam. The iron should be maintained at a dull red heat, and should be freely applied to the cut end of the cord and also to each side of it, so as to prevent any chance of bleeding. The clam is now gradually relaxed. The hot iron should be reapplied in the event of bleeding ensuing before the clam is finally removed. The right testicle is treated in a similar manner. After the cord has been severed, the finger should be introduced into the wound, and the end of the cord freed from any adhesions which may exist between the cord and scrotum.

If, after the operation, excessive bleeding takes place, treat as directed on p. 114.

3. BY TWISTING (TORSION). After the clam has been applied, and after the non-vascular (the posterior) portion of the cord has been divided with a knife, the testicle is simply twisted off by means of a torsion forceps (Fig. 44, p. 124), which is specially made for the purpose. If the operator be unprovided with this instrument, he can catch hold of the uncovered testicle with his hand, and twist it round and round, until the surrounding tissues, cord and vessels, gradually give way. It is well to divide the nerve before applying the torsion forceps, so as to save the animal from prolonged pain, if he is not under the influence of chloroform.

The great advantage of the torsion method, which is the one I prefer, is that it obviates nearly all possibility of bleeding, which frequently follows castration by the hot iron and écraseur, and is naturally alarming to an inexperienced operator.

The question of tetanus or scirrhous cord being more liable to follow castration by one method than that by another, is entirely one of cleanliness during the operation, and of antiseptic treatment (p. 67 *et seq.*) after it.

4. THE COVERED OPERATION, which should be adopted only when hernia is present, may be performed in the manner which Professor W. Williams recommends, by including the scrotum and its contents in a strong wooden clam as close as possible to the belly, and letting it remain on until the testicle sloughs off; or we may remove it with the knife after a couple of days.

It is good practice to keep colts under cover for ten days after castration. The scrotum should be bathed on the third day with warm water, to which a suitable antiseptic (p. 67) had been added, and the wound should be opened up with the finger to allow free escape to any discharge. It is not necessary to do this more than once, unless the scrotum and sheath are very much swollen, when it may have to be repeated. If the animal is kept in a stable, he should have a bed of clean straw to lie on, and not one of peat moss, which is apt to harbour disease germs, such as those of scirrhous cord. A liberal supply of soft diet, residence in a clean, airy box, and judicious exercise greatly facilitate recovery. Horses living in the open can be safely turned out immediately after the operation. Casualties on account of this practice are rare.

In districts where tetanus is common, it would, if practicable, be well to render recently castrated horses immune to this disease by protective inoculation (p. 530).

In castrating donkeys it is probably the best plan to ligature the artery, which has a very rigid wall in these animals.

Peritonitis (p. 114), bleeding (p. 114), scirrhous cord (p. 122), and tetanus (p. 527) are the chief unfavourable results of castration.

Catheter, Passing the.

The male catheter is a long, flexible tube of somewhat smaller diameter than the urethra (the canal by which the urine escapes

Fig. 166.—Lifting up the horse's head when he is on the ground.

from the bladder) and is used to draw off the urine which the animal is unable to discharge. It is provided with a whalebone stillet to give it rigidity.

The horse should be back-raked previous to the operation. If the catheter is to be passed while he is standing up, his two hind legs may be hobbled together, a fore leg held up, and a twitch applied to his upper lip.

An assistant should draw out the head of the penis (*glans penis*) from the sheath. If he finds difficulty in inserting his hand, he should oil or grease the back of it. The operator, standing on the right side of the animal, and having oiled the point of the catheter, should introduce it carefully into the urethra (Fig. 141, p. 351), and

should pass the catheter, containing the stillet, gently upwards until its point arrives at the bend which the urethra makes before it enters the bladder. The catheter can be felt, by the finger, on the median line directly underneath the anus. When the point of the catheter arrives at the bony prominence just below that part, the stillet should be withdrawn, and the operator should place his finger on the point of the catheter, so as to depress it, and to cause it to enter the bladder. He should introduce his hand into the rectum, if necessary. While he is thus guiding the catheter, the assistant should push it upwards, taking care to avoid any roughness in so doing.

The foregoing description is that of the usual manner in which the male catheter is used. Veterinary-Surgeon Desmond performs the operation as follows: "With a sponge, soap and warm water, wash the sheath, and then gently draw out the penis by firm but gentle traction on the glans penis. When the gland is just beyond the sheath, place a fine flexible catheter in the soapy warm water, and pass it gently up the penis as far as it will go. If the urine does not escape, blow air forcibly through the free end of the catheter with the mouth. If the air cannot be heard to enter the bladder, the catheter must be pushed further up.

"Vaseline, fats and oil should not be used. Soapy water is best, and it does not destroy the catheter. The catheter should be finer and more flexible than those usually supplied. I have passed the catheter many thousands of times, and in no case has the animal required to have a twitch, hobbles, or even a leg held up. All that is needed is a man to hold him."

The female catheter is a tube of similar material to the instrument used for horses. It is about a foot long, and is not provided with a stillet.

The orifice of the urethra in the mare is situated on the floor of the vulva and 4 to 6 inches within the external opening, and is guarded by a large valve of mucous membrane. The free end of this valve is inclined backwards, so as to prevent the urine entering the vagina. The urethra of the mare is wider than that of the horse, and is very short. The urinary valve should be lifted up by the point of the right index finger, and the catheter having been well oiled, should be gently pushed onward until it enters the bladder. The urine contained in the bladder will then find a ready escape.

When the bladder has been distended for a considerable time, it may become partially paralyzed, in which case it is good practice, both with the horse and with the mare, to put the right hand in the rectum, and to aid evacuation by exerting gentle pressure on the bladder.

Chloroform, Giving.

See p. 605.

Control, Horse.

I have discussed the subject of horse control at considerable length in "Illustrated Horse-Breaking."

Docking Horses.

This subject is admirably discussed by Dr. Fleming in his "Wanton Mutilation of Animals."

USES OF A HORSE'S TAIL.—The chief office which the normal equine tail fulfils, is to drive away flies and other irritating objects which happen to alight on the hind legs, flanks, genital organs, and lower part of the abdomen. The normal mane performs similar good service for the neck; the forelock, for the face; and the mouth, for the breast. The croup is mechanically protected from these causes of irritation by a thick layer of fibrous tissue which lies under the skin of that part. The skin of the shoulders and portions of the trunk which are not guarded in any of the ways just described, is lined with a thin and very broad muscle *(panniculus carnosus)*, which has great power of twitching and consequently of driving off flies and other objects that may irritate it. In this work, a horse's means of protection are called into play, far more in the open than in the stable, and particularly in hot weather. At grass in summer time, when flies abound, we may often see a long-tailed mare whisking insects off the forehand of her foal, who stands alongside her, and intelligently places his head near her hind quarters, so as to get the benefit of her tail, because his caudal appendage is unprovided with long hairs. All of us who have lived among horses in the open, and especially in hot climates, know that the tails, manes, and forelocks of unmutilated horses at grass, save them from an immense amount of discomfort, similar to what we would suffer, if we were placed under the same conditions, and with our hands tied behind our backs.

In hot countries, the annoyance by flies to horses is so great, that the custom of docking is practically unknown in those parts of the world. The protective layer of fibrous tissue which covers the pelvis of the horse is considerably prolonged both forwards and downwards in the ass, whose tail, by the process of evolution, is consequently provided with long hairs only near its end.

As the hair at the end of the dock grows much longer than at other parts of the dock, the fact of only three or four inches of the tail being removed, will cause such a tail to be out of all proportion shorter than it would have been, had it not been docked; supposing that the hairs were allowed to grow to their full extent in both cases.

Some persons consider that a horse's tail materially helps to balance him when he is turning; but this action on the part of the tail is so slight, that it need not be taken into account for practical purposes.

HISTORY OF DOCKING.—The chief mutilations which have been practised on horses in this country for fashionable purposes, are cropping their ears, nicking their tails, and docking. Shakespeare, in "King Henry the Fourth," makes Hotspur declare that his roan "crop-ear" horse shall be his throne. This practice, which was similar to that of cropping the ears of bull terriers, has happily become extinct. *Nicking*, which is performed as a rule only on Hackneys, consists in the division of the muscles (those of the under surface of the tail) which depress the tail. Hence, when the depressor (sacro-coccygeal) muscles are cut at right angles to their direction, the animal is obliged to constantly hold his "flag" aloft. This brutal operation appears to have been introduced by Lord Cadogan, who was Marlborough's Quarter Master General in the Low Countries in 1701. *Docking* is the term applied to the amputation of a portion of a horse's tail; and *banging*, to the cutting of the hairs of the tail in such a manner, that their ends will form a flat surface which will be more or less horizontal when the animal is in movement. Docking, which is an old operation, was revived in England during the 15th century. Lafeu, in Shakespeare's "All's Well that Ends Well," speaks of a "bay Curtal." During the reign of Charles I. there was little or no docking, which became fashionable in the reign of Charles II. During the latter half of the 18th century, all hunters were docked, and many of them were nicked; and cart-horses were docked close to the body, so as to give them a "bung-tail," which received that name on account of the resemblance which the stump bore to the bung of a barrel! The ignorant people of those days thought that this extreme shortening of the tail strengthened the animal's spine! Leech, who was a particularly accurate artist, gave undocked tails to all the hunters depicted in "Mr. Sponge" (1852), with the exception of the cob ridden by Captain Greatgun, R.N. Docking hunters went out of fashion about the year 1830, and was not revived until the early seventies. "Nimrod," when writing in 1824 on "Hunters," says: "All horses used for pleasure

are docked," but "Cecil," when editing a new edition of that book in 1854, states in a foot-note that "this operation has now become obsolete." I remember that the custom in Ireland during the late fifties and early sixties was to bang the tails of hunters at such a length that when the long hairs were drawn down, their ends were just clear of the points of the animal's hocks, as is the present custom with race horses. In the thirties and forties, long swish tails as well as bang tails were to be seen in the hunting field.

The usual fashion nowadays is to dock all half-bred hunters, and to leave all thoroughbreds undocked, whether they are race horses, chasers, timber-toppers, or hunters. I am glad to say that Lord Lonsdale and Mr. Hedworth Barclay, who are the two most prominent hunting men in Leicestershire, like their hunters to have long tails.

FOR AND AGAINST DOCKING.—The chief arguments in favour of docking are as follows:—1. *That it improves a horse's appearance.* I cannot see how a mutilation can be a beauty. In the judgment on the dishorning case of Ford v. Wiley, Mr. Justice Hawkins states: "Docking is another painful operation which no doubt may occasionally be justified, but I hold a very strong opinion against allowing fashion or the whim of an individual, or any number of individuals, to afford justification for such painful mutilation."

2. *That it prevents him, when he is in draught, from escaping out of the control of his driver, by getting his tail over a rein,* in which case the horse, as a great rule, will remain master only as long as he keeps the rein imprisoned by the downward pressure of his tail. If an animal which is in this position is vicious or nervous, he will probably try to kick the trap to pieces or run away, in which case, the driver will be unable to restrain or guide him. A few horses, probably not more than one in 10,000, acquire the vice of endeavouring, when in harness, to get their tail over a rein, and if they succeed in this dangerous attempt, they will generally do all they can to produce an accident. Here, the position of the driver is an important point for consideration. All Russian harness horses have long tails, and the driver's seat in almost all Russian native vehicles is so low that the reins are seldom held much higher than the animal's stifles. Although the reins are thus in a very convenient position for the horse to swish his tail over either of them; an accident from this cause is practically unknown in Russia, because the driver can at once free the imprisoned rein by a side pull. If the driver's seat is high, as is usually the case in England, he would have to trust

principally to an upward pull, which in all probability would draw the rein up to the root of the tail, where the power of the depressor muscles is at its maximum, and where the horse is much more ticklish than lower down. As the end of a docked tail is much more sensitive to pressure than that of an undocked one, it is reasonable to infer that undocked horses are less liable to get excited or irritable from tail interference than docked ones, which is a fact I have amply proved by experience among all kinds of horses. I consider that this increased sensitiveness more than counterbalances any good effect which ordinary docking may have, in preventing a harness horse from getting his tail over a rein. Accidents which might arise from this cause, are certainly not more prevalent in countries where long-tailed animals are used in harness, than in countries where docking is in fashion. I have never known or heard of anyone being hurt by such a mishap, the chance of which could be reduced to a minimum in single harness by the employment of a kicking strap. If docking were a necessity for the prevention of this occurrence, the fashion which prevails in England of having brougham and hearse horses undocked would not exist. Also, American trotting horses ("standard bred") are not docked. To reduce the chance of a horse in harness getting his tail over a rein, there could be no objection to banging his tail (squaring off the long hairs) close to the end of the dock. Docking horses to prevent them from acquiring this vice is as logical as would be the custom of cutting out their eyes in order to prevent them shying. If a long-tailed horse had that habit, he could be easily prevented from putting it into practice, by tying his tail to the splinter bar. Sitting on the end of a long tail is the usual custom among drivers of match trotters.

The fact that horses are docked at a length which does not prevent them from catching and holding a rein that gets under their tail, is an unanswerable proof that the prevalence of docking in England is due to the dictates of fashion, and not to considerations of supposed danger.

Hardly any horse will kick, on account of getting his tail over a rein, if he has been mouthed according to the "long rein" system which I have advocated and described in "Illustrated Horse-breaking."

In any case, this accident is possible only when the driver is incompetent.

3. *That it prevents a hunter from soiling the coat of his rider by his tail.* This idea is an absurdity, because an undocked horse cannot reach his rider with his tail if it is banged short, which is a fact known to all mounted military men. Besides, mud on a hunting coat is "clean dirt." Thorough-breds, as we all know,

are not docked, whether they are used for racing, chasing, or hunting, and military horses are also exempt from this operation.

4. *That it may be necessary, in order to remove a deformity, injury or disease in the tail.* This argument is, of course, valid in the extremely rare cases to which it applies; supposing, of course, that the remedy was not worse than the complaint.

I venture to think that the conclusion we should draw from the foregoing observations is that docking, with the exception just mentioned, is cruelty, because it causes unnecessary pain. The suffering inflicted during the operation is a mere trifle compared to the misery the mutilated animal has to endure in the open during hot weather. In this respect, brood mares which have been docked are particularly to be pitied, and men who dock fillies or get them docked, merit the contempt of all lovers of horses. Apart from the stud question, a docked mare "in season," especially when ridden by a lady in the hunting field, is a disgusting and indecent sight which should not be tolerated in a civilised country.

THE OPERATION.—Much as I object to the custom of docking, I think I am justified in describing how it should be performed; because, as I have already said, the operation may be necessary in order to correct deformity of the tail, and, in any case, it is well to have it properly done. Its performance by ignorant persons is often the cause of much needless suffering.

Although the pain of this amputation is more or less proportionate to the age of the animal operated on, it is much better to defer the docking till the colt or filly is taken up from grass, than to shorten the tail at an earlier age, so that the youngster may escape as much annoyance from flies as possible. Besides, when the animal is taken up from grass, say, between three or four years of age, his owner, even if he is partial to docking, may see fit to leave the horse's tail alone, as, for instance, if he wants to sell the animal for remount purposes, or to go in a brougham.

Having selected the site of operation, which is generally 4 to 8 inches from the end of the dock (solid portion of the tail), the hair of the remaining part is turned up, and tied tightly with a cord, which acts as a tourniquet. The hair round the intended point of incision is cut off with a scissors, and the exposed skin is disinfected (p. 70). To prevent the animal kicking during the operation, it is advisable to suspend the near fore leg, by connecting it with a stirrup leather to a roller or surcingle put round the horse's body. This method of suspending a fore leg is described in "Illustrated Horse-breaking." A good plan of fixing the part is that recommended by Mr. Slocock, F.R.C.V.S.

("Vet. Journal," July, 1899), who says: "One little wrinkle which I have learnt is to put a strong man at the end of the tail, and let him pull and pull hard. The joint is then stretched, and after the severance is effected, you get very little hæmorrhage." In making the amputation, which is generally done with a docking machine made for the purpose, the great point to observe is to cut through a joint, and not through one of the bones of the tail; for if one of these vertebræ are thus injured, a troublesome wound will ensue. The hæmorrhage can best be stopped by the application of a tail-iron at a dull red heat. When it is laid on the wound, it should be given a few half rotations, to increase its effect. This instrument is made cylindrical in shape, so that it may perform its work of searing the bleeding vessels, without injuring the exposed bone, which should find protection in the central opening of the iron. After the application of the hot iron the part should be treated antiseptically (p. 67 *et seq.*), so as to prevent the entrance of infective germs, such as those of tetanus. An effective dressing, which will also have the good effect of keeping away flies, is a saturated solution of iodoform in eucalyptus oil, or tannoform moistened with spirits. If the bleeding stops, the long hairs of the tail may be left on for a few days as a protection and subsequently trimmed according to fancy. If the bleeding continues, we may soak a pledget of cotton wool in strong tincture of iron, apply it to the wound, and keep it in place by drawing down the long hairs, and tying a string tightly round them, so as to press the pledget against the wound. The strong tincture of iron, which should be renewed as may be required, is a good antiseptic styptic (stopper of bleeding). As a rule, the operation of docking is not allowed to interfere with the daily toil of working animals, such as omnibus horses; although a rest for a few days after the operation would be kindness.

Firing

is the application of a hot iron to the skin. It is generally useful in cases of curb, ringbone, old and troublesome splints, bone spavin, and occasionally in cases of sprained back tendons and suspensory ligaments after all inflammatory symptoms have left the part. It does not appear to act very well in sidebone.

It is surprising how few horses require to be cast for firing. With good assistants, and a little patience, 80 per cent. may be fired extensively while standing, which is much the more preferable attitude for line firing, as the operator can then ensure the regularity of the lines drawn. It is impossible, when the horse is on the ground, to accurately allow for the alteration in position which the

skin will have undergone when he regains his feet. Holding up one fore leg, and applying a twitch will generally be sufficient for control.

I trust none of my readers will be guilty of the not uncommon barbarism of firing a horse "all round;" of firing a sound leg to make him "stand level," when an unsound leg has to be operated upon; or of firing a sound limb as a preservative measure. The precautions (p. 641), as regards health and climate, which should be observed before blistering, apply equally well to firing. The back tendons and suspensory ligament, as I have already said,

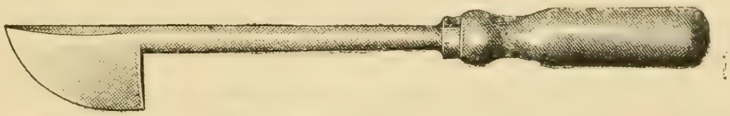


Fig. 167.—Wedge-shaped firing iron.

should not be fired unless all unusual heat and other signs of inflammation are absent from them.

There are two forms of firing,—(1) by lines; (2) by puncture. For the first method, the ordinary wedge-shaped iron (Fig. 167) is employed. It is pointed, and has a convex and moderately sharp edge, which is about $3\frac{1}{2}$ inches in extent. Cast-steel irons are the best, as they are not apt to "scale." When making several parallel lines, it is convenient to lightly mark them with a double iron (Fig. 168), which consists of two ordinary irons welded together, so as to have their edges parallel and at a distance of about half an inch from each other. By using this we can ensure that

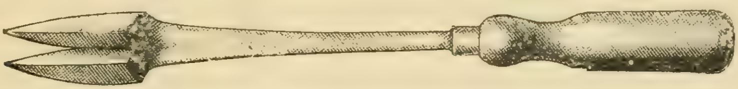


Fig. 168.—Double firing iron.

all the lines shall be exactly the same distance apart. After the double iron has done the scoring, the lines should be deepened with the single one. If the double iron is applied too strongly, the skin between the lines will be liable to slough. Generally, the operator should have a couple of spare irons heating, while he is firing with the one in use. If an iron is rusty, or has scales on it, it should be filed clean before being employed.

The hair should be closely clipped off the part to be fired. The iron should be used at a bright red heat, obtained from a charcoal fire for preference. To render the subsequent blemish as little as possible, it is generally advisable, when firing the legs, to draw horizontal lines, which should be about half an inch apart. If the

extent of the blemish is of no consequence, the iron may be passed through the skin, in which case, the lines should be a little wider apart. Care should be taken, at parts where there is flexion, such as the front of the hock and back of the knee, not to fire too deeply, lest a troublesome wound might be produced. Firing by lines is the most convenient method for sprains of the back tendons, curbs, ringbones, side-bones, and thorough-pins. The skin should on no account be fired in a series of crossed lines; for the isolated portions of skin will be apt to slough, from having been deprived of their proper blood-supply. Many good veterinary surgeons consider it sound practice to rub in a blister, immediately after firing. Although, out of deference to custom, I am inclined to this opinion myself; I have never heard any sound argument advanced in its favour. I may, however, hazard the conjecture that the blister acts beneficially by the fact of its being an antiseptic, especially if its active principle is biniodide of mercury.

If we do not blister after firing, it is advisable to apply a saturated solution of iodoform in ether or in eucalyptus oil to the part.

The best form of puncture firing is that by fine pointed needles (p. 259), which can be heated in a fire or in a specially made lamp (thermocautery). In order to avoid infection, these needles should not be reapplied before they are again heated. Or we may use a pear-shaped iron (Fig. 99, p. 261).

Fomenting.

A fomentation is, strictly speaking, the application to the skin of heat and moisture by some vehicle such as flannel or spongiopiline. In stable parlance, bathing any part with warm water is also called "fomenting."

Fomentations over large surfaces, are best applied by dipping a blanket or other woollen cloth in hot water, wringing it moderately dry, applying it to the part, and then covering it with a waterproof sheet or dry blanket. When the underneath blanket loses most of its heat, it should be changed for another; care being taken that the animal does not get chilled during the interval. The fomentations should not be hotter than the hand can comfortably bear.

Hand-rubbing and Massage.

We have seen in Chapter II. that the materials for building up and repairing the various tissues of the animal body, are brought to them by the blood in the arteries and capillaries; and that waste and inflammatory products are removed in the form of lymph

by the lymphatics, which pour their contents into the veins; the useless and hurtful constituents of the lymph being finally expelled from the system chiefly by the lungs, kidneys and skin. Any unduly long retention of these deleterious substances in the body will naturally be followed by a corresponding loss of health. In this respect, the products of inflammation need special attention, for the longer they remain in the tissues, the more liable are they to set up degenerative changes and adhesions, both of which are very likely to produce permanent disability in the affected part, as for instance, in the case of sprain.

The removal of lymph is greatly facilitated by the fact that numerous valves are present in the lymphatic vessels and in all veins subject to local pressure from the muscles or tendons in their vicinity. As these valves open only towards the heart, pressure on these vessels will have the effect of driving the contained lymph or venous blood in the same direction, which is its natural course; its flow in the opposite direction being prevented by closure of the valves. Under ordinary conditions, the flow of the lymph towards the heart is chiefly effected by pressure due to the movements of the muscles and organs of breathing. The good effects of this pressure can be very beneficially supplemented, in health and disease, by properly applied hand-rubbing (massage), which important fact has been recognised by the Chinese, 4,000 or 5,000 years ago; by the natives of India, Fiji and Persia, for many centuries; and by the ancient Greeks and Romans. Ambroise Paré (1517-1590), who was the founder of scientific surgery in France, appears to have been the first among Western surgeons to have recognised the benefits to be obtained from this practice. Since then, Ling of Sweden (1776-1839) and other leaders of progress have put massage on a scientific basis. In England, Sir William H. Bennett ("Lectures on the Use of Massage"), Dr. Kendal Franks ("The Dublin Journal of Medical Sciences," Nov. 1891), Dr. Symons Eccles ("The Practice of Massage") and many other distinguished practitioners have wisely advocated its employment in sprains, bruises, fractures, dislocations, diseases of joints and nerves, and other affections in human beings; but veterinary surgeons have been comparatively silent on this important subject. It is true that they advocate hand-rubbing of the legs, which practice, unfortunately for horses, is generally performed in a wrong manner, namely in a direction opposite to that of the course of the lymph (from above downwards).

Dr. Kendal Franks states that "experience has shown me that in sprains, if taken in hand at once, a cure may be effected in from ten days to a fortnight; slight sprains in a few days; but even in severe sprains, although some weakness may continue for some

weeks, the power to walk freely and painlessly is restored in a short time, rarely exceeding a fortnight. If the treatment be delayed until adhesions have formed, massage will be required for a longer time; and if the adhesions have had time to become firm, it may be necessary to rupture them under an anæsthetic before massage can be expected to be of much avail."

We learn from Sir William Bennett that passive exercise (p. 24) "should always be preceded by smooth massage, which sooths the irritable muscles so completely that movements of the most complete kind are readily employed without exciting muscular contraction of a harmful sort."

In horse practice, the most useful forms of massage are rubbing (*effleurage*) and kneading (*pétrissage*). In both, the pressure should be exerted more or less in the direction in which the lymph flows (towards the heart), and should be firm, after the first few movements; in fact it should be applied, so as to resemble muscular pressure as nearly as possible. When the rubbing or kneading is liable to irritate the skin, a little lanoline or vaseline can be applied to the hands, so as to diminish friction.

"Rubbing consists in gentle stroking and rolling of the skin, gradually increasing in strength to moderately firm rubbing, in a linear or curvilinear fashion, the firmer friction being always employed in the direction of the blood and lymph currents towards the heart. Over large muscular masses, the whole palmar surface of one or both hands should be kept in close application to the patient's skin, while in the smaller areas of the feet and hands, and over bones unprotected by muscles, the palmar surface of the thumbs and finger tips will be most conveniently employed. . . . A good rubber will not relinquish the apposition of the palm to the patient's skin, until the whole series of centripetal [towards the heart] and centrifugal [away from the heart] strokes constituting the *effleurage* of the part is completed. The extent of the stroke in length will depend upon the dexterity and reach of the operator as well as on the part of the body to which it is applied; but, speaking generally, the greater the extent, the more grateful to the patient will the manipulation prove to be" *(Eccles).* The downward stroke should be light in all cases. The correct speed of these double strokes may be put down at about 100 in the minute. We learn from Dr. Eccles that in kneading, the base of the palm of the hand should be kept close to the skin of the massaged part, and that the squeezing should be done between the adducted (brought together) fingers and the base of the palm of the hand; and not between the fingers and thumb, as in pinching.

In hand-rubbing the tendons and ligaments of a horse's fore leg, between the knee and fetlock, we should hold up the leg with

one hand, and should begin by gentle rubbing from below upwards, by means of the balls of the finger tips, thumb and palm of the other hand; the pressure being gradually increased until it is fairly firm. The stroke should be made through the whole extent of the cannon bone, and its strength should be decreased as it approaches the knee. Kneading can be subsequently employed, as the case may indicate. The fact of the flexor tendons and ligaments being relaxed by the knee and fetlock being bent, will greatly aid the good effect of the massage.

In veterinary practice, massage is particularly useful in sprains, bruises (including inflammatory swellings from unevenly distributed pressure, as in saddle and harness galls), synovial enlargements (p. 322), serous cysts (p. 333), swollen joints, sore shins (p. 246), and in the first stages of splints.

If the skin of a part which requires to be massaged is broken, the rubbing or kneading should be applied only to the neighbouring parts that have their skin intact.

Massage is valuable not only in cases of injury and disease, but also for promoting the general health, and for preventing it being lowered under ordinary conditions of life. For instance, it is particularly useful in the relief of muscular fatigue, the feeling of which arises from the presence, in the over-worked muscles, of certain waste products of muscular contraction, which more or less paralyse the muscles for the time being. We may therefore conclude that their removal is the cause of the rapid restoration of muscular vigour which follows well-applied massage in these cases. Referring to the experiments of Zabludowski in demonstrating the restorative effects of massage on fatigued muscles, Dr. Eccles tells us that "in a series of experiments on able-bodied men, in whom the muscles of the fore arm were rendered powerless both by the exhaustion following rhythmical contractions stimulated by the induction current, and by the fatigue of squeezing a dynamometer until the pressure became so feeble that the indicator could not be made to travel beyond five pounds. In every case the limb was subjected to ten minutes' massage, with the result that whereas ten minutes' rest alone produced little or no effect on the pressure, after massage the indicator pointed to a rise of from forty to fifty pounds. The measurement of the limbs before and after massage was taken, with the result that at the period of greatest exhaustion, the circumference of the fore arm had increased in some cases three-eighths of an inch; at the conclusion of ten minutes' rest without massage no diminution had occurred, but after massage, three-fourths of an inch decrease has been noted." These experiments scientifically prove that the good effects of massage on fatigued horses, should be largely utilised. In England, the

ordinary strapper or even stud groom regards grooming as merely a form of "eye-wash"; but a capable Indian *syce* knows how to *hath mulna* (massage) a fatigued horse, so as to make him fresh again in about twenty minutes.

The evident pleasure which stroking gives horses, cats, dogs and other animals, and the delight which tired horses take in rolling, are convincing proofs of the health-giving effect of massage. In India, I have always remarked that while a horse was being hand-rubbed by a good *syce*, the animal did his best to help his masseur, by bringing his weight against the man's hands. Patting on the neck, which is gratefully appreciated by all horses, is a form of massage that is known to medical men as *tapotement*.

My readers will find much useful information about massage in the writings of Dr. Eccles, Sir William H. Bennett, and other authorities.

Killing a Horse.

Theoretically, the most effective way to shoot a horse, is to aim so that the bullet will go through the brain and enter the spinal cord. This condition, which is difficult to obtain, is apparently well fulfilled in Fig. 169, which is a reproduction of a photograph I took in South Africa in 1901. The entrance of the bullet through the centre of the brain is almost always certain death, even when the spinal cord is not touched. A good and easy plan for killing a horse with either pistol or gun, is to shoot him in the middle line of the forehead, about four or five inches above the level of the eyes; for instance, in the centre of the "star" in Fig. 170. The weapon should be held close to the forehead. If this be done, the animal will drop down, without a struggle, on the spot upon which he had been standing. Or, having opened the jugular vein, we may, by means of a tube, blow air into the vein in the direction of the heart, when death will ensue from suffocation (p. 640)

A very easy and effective method of shooting a horse is by means of Greener's "Humane Cattle Killer" (Fig. 171), which is an invaluable help in slaughter houses or when large numbers of useless and disabled horses have to be destroyed, as often happens, during war time. The fact of its being noiseless greatly enhances its value in enclosed areas.

Neurotomy *(Neurectomy)*.

In surgery, the operation of removing a portion of a nerve or nerves, which is almost always done with the object of depriving the part of sensation, is termed *neurectomy;* but in popular

language it is called *neurotomy*, which signifies the mere cutting of a nerve or nerves. It has special reference to sensory nerves, which, like those of feeling, convey impressions inwards to the brain and spinal cord; the reply being transmitted outwards by motor nerves. If, for instance, our hand receives a wound, its sensory nerves convey the impression of pain to their nervous centre, which thereupon excites the motor nerves of the hand and arm to draw the limb back. If, in such a case, neurectomy of the

Fig. 169.—Shooting a horse.

motor nerves of the part had been performed, pain would be felt, but no response would be obtained from the muscles, which, as a result of the neurectomy, would be in a paralysed condition. If, on the contrary, neurectomy only of the sensory nerves had been made, there would be no pain, and consequently no muscular contraction; although the nervous centre could cause movement by acting on the motor nerves of the part. Hence, when a horse is lame from an incurable disease which, like navicular disease, renders movement painful, it is well to remove sensibility by neurectomy. The operation will then have to be performed

on the sensory nerve or nerves, above the seat of pain, so that no painful impression can be received by the nerve centre. If the nerves be simply divided (neurotomy), the cut ends will unite after a short time, sensation will be restored, and the operation will be resultless.

High plantar neurectomy and median neurectomy are the two varieties of this operation which are most commonly practised on a fore leg. The former deprives the foot and pastern of sensation; and the latter produces a similar effect on almost the entire limb, from a little below the elbow. Hence, it is specially useful when the seat of pain is in the knee or fetlock. It consists in the removal of about an inch of the median nerve on the inside of the leg, just below the elbow, and at the rear edge of the radius (the chief bone of the fore arm). It is frequently performed on city cart and cab horses. As I have never done this operation, I am unable to describe it, which is a fact I regret, because I believe it is the better operation of the two. The following remarks on neurectomy will therefore be confined to the high plantar operation, which I have frequently performed.

The two nerves which endow the horse's foot with the power of feeling, pass down each side of the leg, just in front of the perforans tendon (Fig. 6, p. 31), immediately above the fetlock joint. These nerves are about the thickness of an ordinary piece of twine, and are white, tough, and fibrous in appearance. Each of them is accompanied by a vein and artery, the former being in front; and the latter, as a rule, in the middle. The word "van" furnishes us with a useful aide-mémoire by which to remember how these structures lie. Their relative position, however, is not invariably constant.

NEUROTOMY AS AFFECTING A HORSE'S USEFULNESS.—"That the tactile sense in the horse's foot is useful, it would be idle to deny; but that it is absolutely essential even to safe progression, no one who has paid attention to the results of plantar neurotomy will maintain. On several occasions, for years I have hunted, hacked, and driven horses which have been deprived of sensation in their fore feet, and never had an accident with them. Their action has not been impaired by the operation; on the contrary, it was vastly improved, compared with what it had been previous to it. And my experience has not been singular in this respect, as many competent horsemen can give like evidence after long and severe trials of neurotomised horses. The opponents of neurotomy were probably not aware that there is in progression a muscular as well as a tactile sense" *(Fleming).*

INDICATIONS AND UNFAVOURABLE RESULTS.—"The effects of neurotomy are certain and durable when it is employed at the commencement of navicular disease, and when the ailment is confined to one foot. It can be easily imagined that it is impossible for the operation to be successful, when the navicular bone and tendon are destroyed by ulceration" *(Peuch and Toussaint).*

The same authors strongly recommend the operation in cases of chronic lameness from sidebones; ringbones, except when they are accompanied by bony union of the joint; chronic laminitis; in-

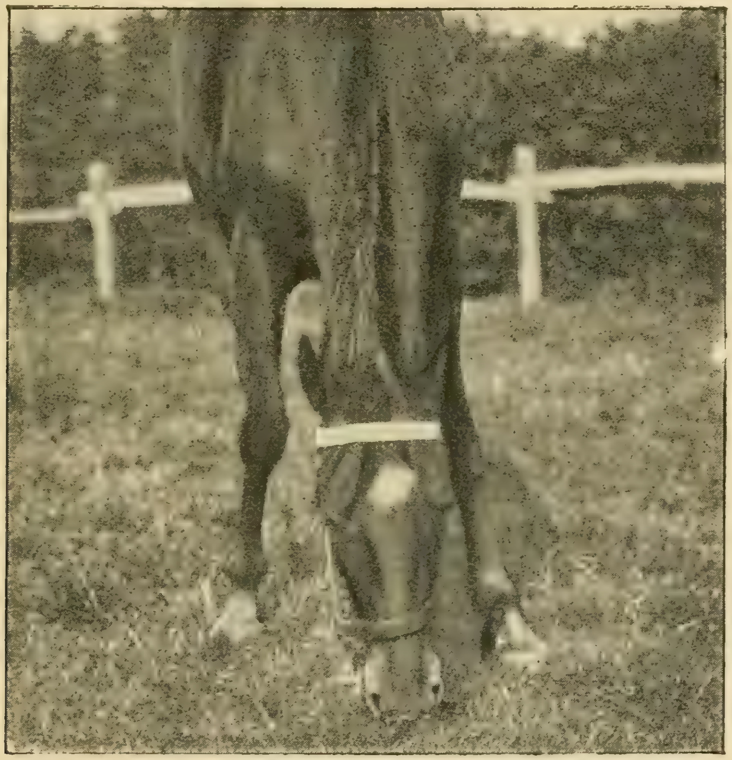


Fig. 170.—Horse in a convenient position to be shot

juries to the hoof which may have caused a bony formation on the pedal bone, or may have had the effect of increasing, to an abnormal extent, the local growth of the inner horn of the hoof, constant pain from pressure being the result in either case; or from surgical operations on the foot. English veterinarians consider that horses whose feet have suffered more or less from laminitis should not be "un-nerved." Such feet are generally flat, and have weak soles and heels.

It is probable that inflammatory action is less liable to be excited in a neurotomised foot than in a sound one.

It is evident that good results from high plantar neurectomy, can be confidently expected only when it is performed during an early stage of a foot disease to which it is applicable.

As an "un-nerved" horse when being shod, runs the risk of being pricked without the owner or attendant becoming aware of it, until most serious results subsequently manifest themselves; the operation is more useful in countries where horses can be worked barefoot than in those whose working animals require to be shod. Softening of the back tendons and sloughing off of the hoof are two formidable accidents that may happen as results of neurotomy, and are more liable to follow the high operation than the low one, which is performed below the fetlock. It is commonly supposed that these complications are due to the deprivation of nervous influence which the foot has undergone. H. Bouley argues against this view, and advances the fact that after this operation, the wound heals in a perfectly healthy manner, and that the secretion of horn does not appear to be injuriously affected in any way. Chauveau divided all the nerves of the limbs without causing any interference with their nutrition. H. Bouley considers that these accidents are due to increased concussion of the hoof with the ground, owing to the foot having lost its feeling, and adds that "in general the effects of neurotomy are much more efficacious and durable in the case of horses used for slow work than in those which are employed at fast paces."

It appears from the foregoing considerations that the reason why neurotomy of both feet is so much more liable to be followed by unfavourable complications than that of a single foot, is that, in the former case, the horse is without any indication to guide him in regulating the amount of concussion which his feet can safely bear, and is consequently liable to knock them about unnecessarily; but in the latter we find, from the fact of his going "level," that he does not (accidents excepted) put more weight on the "un-nerved" foot than he does on the one whose sense of feeling is intact. Besides, he is specially liable to suffer from the ill consequences of injuries which in his case are often greatly aggravated by unintentional neglect, owing to the absence of lameness.

THE OPERATION.—In order to effect a rapid healing of the wound, and to diminish as much as possible, the subsequent scar, the operator should strictly adopt, as regards his hands, instruments, and the skin of the part, the antiseptic precautions described on p. 70. It is well to use an Esmarch bandage and

tourniquet (p. 682), to keep the part in a bloodless condition, and thus to facilitate the finding of the nerve, which will be a great assistance to inexperienced operators, who are apt to become con-

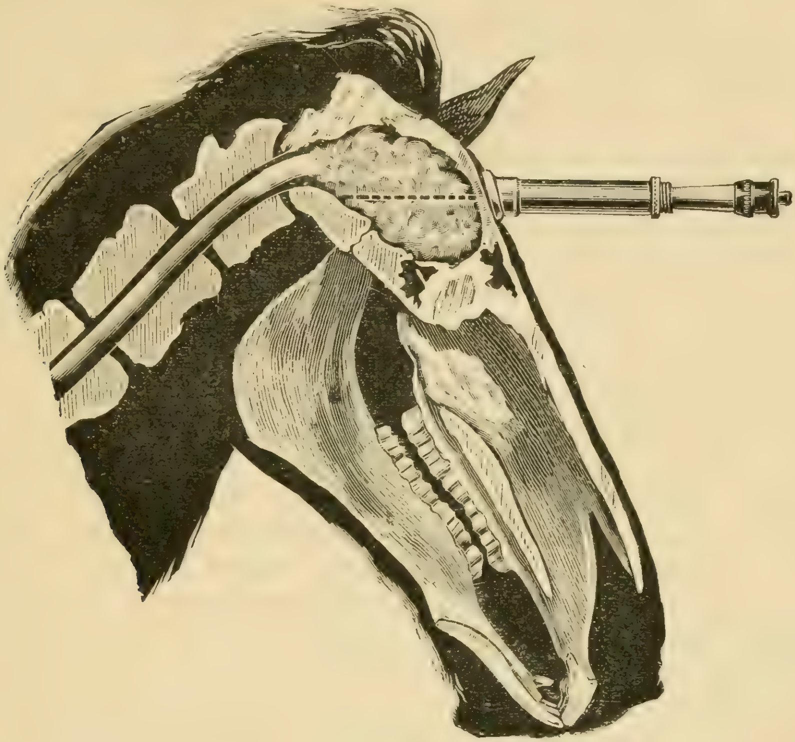


Fig. 171.—Greener's Humane Cattle-killer.

fused by a continued flow of blood. To anyone who is conversant with the anatomy of the part and who has a fair amount of self-possession, these aids are in no way essential to success; for the discovery of the nerve to such a one is a very easy matter. The

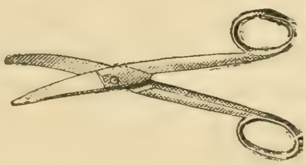


Fig. 172.—Probe-pointed curved scissors.

hair should be removed (with, for instance, a probe-pointed curved scissors, see Fig. 172) from the site of the intended incision.

After casting the horse with the hobbles on the right side, if the operation has to be performed on a right foot, and *vice versâ*, we remove the foot from its hobble and draw it forward by

means of a noose of stout webbing or cord passed over its pastern to steady it. The nerve on the inside of the leg is the one which should be first divided; because the wound will then escape contact with the ground or bedding. An incision of about half an inch long, above and just clear of the fetlock joint, and immediately over the front edge of the back tendons, is all that is required. The readiest method of making the incision is to pinch up between the fingers a fold of skin just above the fetlock, so that the fold may lie across the course of the nerve. An incision about half an inch in length should now be made with a pair of rowelling scissors (Fig. 139, p. 338) across this fold of skin, in the direction of the length of the leg, and over the course of the nerve, which will thus become exposed to view, or which may be found with very little trouble. As the horse which is not under the influence of chloroform or cocaine, will make a violent backward movement with his leg on the snip being given with the scissors; the operator should work from the front. The peculiar shape of the rowelling scissors, with its powerful leverage and curved-in points, will greatly facilitate the making of the incision. If the animal be under the influence of chloroform, the knife, which is certainly the neater weapon of the two, should be employed. I have seen such disastrous results from the use of the knife, even in professional hands, that I would deprecate its employment at this stage of the operation, or when freeing the nerve from its surrounding connective tissue, unless the patient has been rendered insensible by some anæsthetic, such as chloroform or cocaine.

The incision through the skin having been made, we expose the nerve, which may not at first be visible, by tearing away the loose overlying tissue by means of some blunt instrument, like the point of a pin director or of a dissecting forceps. This tissue readily gives way, and no risk is run, in the event of the animal struggling, of wounding the artery or vein, either of which eventualities would by a copious rush of blood greatly interfere with the operation, unless a tourniquet is employed. The nerve should not only be exposed as much as the length of the incision through the skin will allow it to be done; but should also be freed from any attachment on its under side, by passing the instrument, whichever one be used, under the nerve.

The vein being dark in colour, may be easily distinguished; but the difference between the artery and nerve is not so readily seen. The former, however, is larger than the latter, and is more "yielding" when pressed by the forceps. Its "throbbing," also, will indicate the circulation of blood through it. With a tourniquet, there will of course be little or no throbbing, and the

artery will be in a collapsed state. The nerve, when cleared of its surrounding connective tissue, looks white, shows longitudinal fibres, feels hard, and is extremely sensitive when the animal is not under the influence of chloroform. The operator having dissected the nerve clear of any loose tissue, may pass a curved suture needle, armed with thick thread, under it; in doing which, a pin director will come in handy. The thread should now be knotted in a loop and the needle cut off. The nerve, by means of the thread, may be pulled out and divided as high as possible, with a sharp, narrow knife. This snip will naturally inflict intense, though only momentary pain on the animal, if chloroform or cocaine has not been used. Sensation being now destroyed, the horse will cease the struggles he had made, up to this, whenever the nerve was touched. The free end is pulled out of the wound, and as much of the nerve is cut off at the lower end of the incision as the operator can get at. Unless at least an inch in length of the nerve is removed, sensation may become re-established after a few months by nervous union taking place between the cut ends. The horse should now be turned over and the operation performed on the outside. The object of drawing the nerve out is to prevent the cut ends from becoming involved in the healing of the external wound.

The fact of the part having been previously blistered, greatly increases the thickness of the skin and underlying tissue, and adds to the blood-supply in them.

Any blood, the presence of which might impede the work, may be "sopped" up with a piece of antiseptic cotton-wool. The part should be treated by some antiseptic solution (p. 67), and the wound may be closed by a stitch of carbolised catgut or suture wire, although such means will rarely be required, on account of the smallness of the incision. After the horse has been allowed to regain his feet, the blood issuing from the wound should be "sopped" up as before, with antiseptic cotton, and when it has stopped flowing, a dry antiseptic, such as tannoform, should be put on and then a thick covering of antiseptic (*e.g.*, salicylic acid, iodoform, eucalyptus, or boracic acid) cotton-wool, which may be kept in its place by eight or ten layers of corrosive sublimate gauze rolled round the leg. If a lotion has been used, we should apply over the whole, gutta-percha tissue, so as to prevent evaporation. The dressing can be left on for a week, after which time the wound ought to have healed up with but a slight scar.

The employment of chloroform naturally renders the operation easier, especially for an inexperienced operator, and saves the horse from unnecessary pain.

"When neurotomy of both fore feet is indicated, it is prudent to allow a few days' interval to elapse after the operation in one leg, before performing on the other" *(Peuch and Toussaint).*

After "un-nerving" a foot, special care should be taken, for a couple of months at least, not to subject it to violent concussion, and great attention should be devoted to its shoeing and general management.

In the event of fracture of the navicular bone, after neurotomy, there is elevation of the toe of the foot, which does not occur in cases that have not been operated upon. Such a fracture not unfrequently happens when the bone has suffered for a long time, from navicular disease.

After neurotomy, there is generally an increase of growth of horn, on account of the division of the sensory nerves causing dilatation of the blood-vessels, and, also, by reason of the animal bringing the foot more into use.

Periosteotomy.

See p. 242.

Pulse, Feeling the.

The pulse is usually taken at the lower jaw; its character, there, being better marked than at other convenient situations. The artery (submaxillary) may be felt underneath the lower jaw, a little in front of the fleshy part of the cheek. On passing the fingers of the hand over the spot, two vessels can be distinguished lying closely together; one, the duct which conveys saliva from the parotid gland into the mouth; the other, the artery (the facial) which mainly supplies the face with blood. The middle finger should be applied so as to gently press the artery against the inner surface of the bone. The ball of the thumb should not be placed on the outside of the jaw, lest the operator might mistake the pulsation of the artery of his thumb for that of the horse's artery.

The following description of observing the pulse at other places, has been kindly placed at my disposal by Professor Vaughan.

The pulse at the sub-zygomatic artery, which is the easiest of all to feel, can be taken by placing the pad of the middle finger gently on the horse's cheek, a little in front of the posterior edge of the lower jaw-bone, and about an inch below its joint. The proper spot is about 4 inches below the ear.

Very frequently the indication of the artery of the fore-arm (the posterior radial) is the one adopted. This vessel is on the

inner side of the fore-arm, and may be felt by inserting the hand, from the front, between the breast and fore-arm, and feeling for the slightly prominent head of the bone (radius) just below the elbow joint. The place is described anatomically as being situated just behind the insertion of the flexor brachii muscle. Care should be taken, as the artery is but loosely attached, not to push it out of position when searching for it with the fingers.

Below the hock we may take the pulse of the artery (the great metatarsal) which runs down the groove between the cannon bone and the outer splint bone, by gently pressing a finger on the upper third of this groove.

The middle coccygeal artery, which occupies the groove running along the lower surface of the tail, will also afford an indication of the pulse. It should be felt close to the body.

The usual rate per minute of the pulse of heavy cart-horses is about 35, of well-bred horses about 40, and of small ponies about 45. The younger the animal, the quicker the pulse.

Puncture of the Intestine for Flatulent Colic.

This operation is performed by means of a trocar and cannula. The latter is a metal tube which forms a sheath for the former, and is usually about $\frac{1}{5}$th of an inch in diameter and 6 inches long. Professor Macqueen wisely advises that a cannula should be 9 inches long, and $\frac{1}{8}$th inch in diameter. The trocar is a steel, triangular-pointed rod which fits into the cannula, and is provided with a handle to facilitate its insertion into and withdrawal from the bowel.

The operation is performed in order to give vent to gas which has collected in the intestines during an attack of flatulent colic. Very little risk attends it when done under antiseptic conditions (p. 70), which consist in clipping or shaving the hair at the seat of operation, and disinfecting the part and the instrument. The veterinary surgeon should place his hand up the rectum to find out where the gas has chiefly accumulated, and where he ought, consequently, to drive the instrument.

The puncture should be made if the symptoms do not become relieved by the medicine given; but it should on no account be delayed until the horse becomes exhausted, lest fatal complications, such as rupture of the stomach or intestines, may ensue.

The puncture is made on the right flank, and generally at a spot equi-distant from the point of the hip (anterior iliac spine), the end of the last rib, and the side processes of the vertebræ of the loins (Fig. 115). Mr. J. G. Rutherford ("Vet. Record," 8th March,

1902), states that "although it has been my fortune to tap hundreds of horses, I have never been troubled with subsequent suppuration, and I attribute this largely to the practice of invariably puncturing in a downward direction, and from a point as high up as possible." If the first puncture—owing to blocking up of the cannula, to its being too short, or to the intestines being filled with solid matter—does not succeed; we may repeat the operation a little above or below the first puncture, on the left side, or where we perceive the accumulation of gas to be greatest. Many authorities agree that the puncture can be made without danger on the left side.

In order to injure the intestines as little as possible, and to prevent the chance of particles of food getting into the abdominal cavity, and thus setting up peritonitis, we should use an instrument of small diameter. In fact, the smaller the diameter of the cannula, other things being equal; the less risk is there in the operation.

For securing the animal, it is generally sufficient to tie up one fore leg, and to apply a twitch. We ought, if possible, to take the opportunity of making the puncture when the animal is lying down, and should carefully guard against the chance of injury to the horse, while the puncture is being made, from his throwing himself about when suddenly seized with colicky pains. The animal can be kept lying down by means of hobbles.

The operation itself is a very simple affair. The operator, having placed himself on the right side of the horse, should make an incision through the skin with the knife, at the point chosen, of a little less than half an inch in length, in order to allow the trocar to penetrate easily, and to prevent air getting into the loose tissue underneath the skin. Then, while holding the instrument with his left hand, he should place its point into the incision, at right angles to the surface of the skin, and should strike the handle a sharp blow with the palm of the right hand, so as to make the point of the trocar penetrate the intestine. The gas escapes with violence on the trocar being withdrawn out of the cannula. In proportion as the gas escapes, so does the inflation of the intestines diminish. We should take care to press the cannula as far as it will go, so that its lower end may be in the intestine, and may not remain between it and the flank. If the escape of gas stops suddenly, on account of the cannula becoming obstructed, the instrument should be mopped out by means of a small metallic stem prepared for that purpose, but not with the trocar, which might wound the intestine. If these means do not succeed, a second puncture, some distance from the first one, may be made.

The cannula should be kept in until the gas ceases to escape and the inflation has nearly disappeared. It is always prudent not to

leave the instrument longer in than a quarter of an hour, so as to avoid, in some measure at least, the chance of peritonitis. Some practitioners take it out after five or six minutes, if the escape of gas has ceased by that time. Another objection against allowing the cannula to remain long in, is that it might wound the intestine during the struggles of the animal, or on the collapsing of the bowel.

To remove the cannula, we should seize it with the right hand, and should raise it rapidly, but without roughness.

There is no need to do anything to the external wound; as the puncture becomes closed up by reason of the hole which was made through the skin, shifting its position away from that made through the abdominal muscles, on the swelling going down.

The practice of *injecting medicines through the cannula* is dangerous; for the fluid might go the wrong way and escape into the abdominal cavity, with the very probable result of peritonitis

Fig. 173.—Curved seton needle.

and death. It is much better, as a rule, to give a drench in the ordinary manner.

Setons

are pieces of tape or other suitable material which are passed into various tissues in order to set up irritation in the part, and consequently to draw an increased supply of blood for the repair of some neighbouring diseased or injured structure. The best kind is broad white linen tape, or as broad a strip of calico as the needle will take. A seton needle is a large, flat, steel needle made for inserting the tape, and may be straight or curved (Fig. 173). Those used about a joint, such as the hock, should have the point blunt, in order to prevent injury to the capsular ligament; but should have the sides sharp. Rowelling scissors should be used to cut through the skin at the points for insertion and exit of the seton needle. A handle, to which the needle may be fixed, is employed to force the point through deep-lying, or hard tissues. When the tape is passed through the part, its ends may be tied together, or knotted separately, an inch or two being left over, and the extra lengths are cut off. The tape, as long as it remains in the part, should be pulled backwards and forwards a little, once or twice every day, so as to keep up a continued state of irritation. The

tape, before being inserted, is sometimes smeared over with blistering ointment to increase the irritation. The object of the seton will usually be accomplished, when free suppuration has been set up, which will be in five or six days. A seton should not be allowed to remain longer than ten or twelve days in any part in which a subsequent blemish would be a matter of consequence.

Slinging

is the employment of means for resting a horse when it is indispensable that he should be kept standing, or when he is unable to lie down. In the absence of properly-made slings, a good substitute may be obtained by taking a sheet of thick canvas, such as a strong sack, which will suit admirably as regards size, and is generally available. Each end is turned over and sewn firmly on to a piece of wood a little thicker than a stable-fork handle. This impromptu sling having been passed under the horse's belly, ropes are attached to the four free ends of the pieces of wood, and are made fast to the rafters of the stall, or other convenient supports. Slings should be provided with a breastplate and breeching to prevent the horse slipping forward or backward, and a chain block is used to lower or raise the slings at pleasure.

Slings, when used, should lightly touch the abdomen of the horse when he stands up, so that he may rest in them, or not, as he chooses. The animal should never be suspended in them; for in that case they would interfere with his breathing and digestion. Employed as I have advised, he will readily accept the offered support, if he is in need of it.

Slings form an admirable means of control in cases of irritable or vicious horses whose hind legs have to be dressed on account of injuries, etc.

Steaming the Nostrils

is very useful in cases of inflammation of the air-passages. It may be done by soaking hay in boiling water, and then placing it in a nose-bag which is to be put on the horse's head. Two nose-bags may be alternately employed. A better arrangement might be made with a kettle, to the spout of which is attached a piece of india-rubber tubing to lead into a deep nose-bag half filled with hay. The addition of 1 part of oil of turpentine to 4 or 5 parts of water, may prove useful for steaming the nostrils in cases of bronchitis, and sore throat. In these affections, I would suggest the employment of inhalations from carbonate of ammonia, an ounce of which might be placed in a nose-bag to be put on the horse's head. It will not require the aid of heat.

Sutures.

See page 73.

Thermometer, Use of the Clinical.

This instrument is employed for taking the internal temperature of the body, which is most conveniently done by placing the instrument for about three minutes in the animal's rectum. Owing to the almost general adoption of this method, the expression " internal temperature " is used as a rule to signify " rectal temperature ; " although the respective temperatures of different parts of the body vary to a slight extent. The practice of placing the thermometer in the mouth, as is the custom in human medicine, is not suitable to horses, owing to the danger of the animal breaking the glass instrument with his teeth.

The indications afforded by the clinical thermometer are valuable guides as to the state of the animal's health at the time, or to what it will shortly be. Thus, in a horse at rest under ordinary conditions, if there be a rise of three or four degrees without the animal evincing any other sign of illness, we may be assured that disease in some form will, after a day or two, manifest itself in him. During illness, a temperature of, say, 106° F. or more points to a condition of great danger.

The clinical thermometer is specially useful for indicating the state of the horse during infective diseases and diseases of the organs of breathing. A fall in the temperature, when it has been abnormally high, will generally point to a favourable termination of the disease ; although in some cases it is the precursor of rapidly approaching death.

TEMPERATURE DURING HEALTH.—As a rule, there is a daily variation in the internal temperature of a healthy horse, of about 1° F. ; the maximum being attained at about 5 o'clock in the evening. In the adult horse, the temperature is about 1° F. higher than in a very young or a very old animal. It is about 1° F. less in the mare than in the horse, except when she is " in season," during which time it is about 2° F. higher than normal. The temperature of thorough-breds is higher than that of common horses. A rise of 4° or 5° F., compatible with health, may be observed in horses doing violent work in hot weather. The temperature of well-fed horses is higher than that of poorly-fed ones. During digestion it rises about 1° F., and falls about the same amount during sleep. Nocard shows that exposure to the rays of a hot

sun for a few hours may cause a rise of as much as 3.5° F., and the effects of cold and rain may equally lower it. I have often seen horses in India and South Africa have a temperature of 105° F., without any derangement to their health, when they were picketed in the open during hot weather.

The average internal temperature of a healthy horse is about 100° F., varying, say, from 99° to 101° F. Cadéac puts it at from 99.5° to 100.4° F. Professor Hobday finds that the average temperature is 100.3° F. As an approximation, we may say that a rise or fall of more than 2° F. is not compatible with health, unless there have been specially exciting causes. Referring to India, Haslam states that among healthy horses at rest, the range of temperature is from 98.5° to 100.5° F.; and among apparently healthy, though poorly-fed "grass-cutters'" ponies, from 97.4° to 101.4° F.

Tourniquet and Esmarch Bandage.

A tourniquet is an instrument which is used to stop the circulation of blood in a part, by pressure on the local blood-vessels. Usually, it consists of an india-rubber tube, which is about $\frac{3}{4}$ inch in diameter, and is very rarely applied to any part, except the limbs. Its chief value is in the prevention of bleeding during surgical operations, such as those of neurotomy (p. 668) and removal of splints (p. 242), in which cases, the tourniquet is best applied two or three times round the leg above the knee; because, if it is put on below the knee, its pressure will be unequally distributed, owing to the almost total absence of muscles in that part. The most generally useful form of tourniquet is Arnold's Reliance Tourniquet, which is an india-rubber tube about $2\frac{1}{2}$ feet long, and provided with a flat hook, through which the other end, after compression by the finger and thumb, can be passed (Fig. 174). If this flat ring is of the proper size, the end of the tube cannot be pulled through it, and it can be released only by taking it out of the ring. We can improvise a good tourniquet, by wrapping round the leg an ordinary rubber tube, which can be obtained from any ironmonger, and securing it by a reef knot (Fig. 175). This tube will have to be about 4 feet long, because it is not so elastic as specially made tubes. Tourniquets are sometimes provided with a pad to be placed over the principal artery or arteries of the part, so as to increase the effect of the pressure; but this arrangement is seldom necessary in horse practice.

As a tight tourniquet more or less stops the passage of blood underneath it, there will be comparatively little bleeding from a

wound made on the limb at a spot below the tourniquet. The occurrence of this bleeding can be almost entirely prevented, by the previous application of an Esmarch bandage, which consists of a thin india-rubber band about $2\frac{1}{2}$ inches broad and $8\frac{1}{2}$ feet long. It is rolled tightly round the leg, from below upwards; beginning at the pastern and ending just above the knee (Fig. 176). A tourniquet is then put on immediately above the bandage, which is taken off, by undoing it from below upwards. The application of this bandage drives away the blood, which is prevented from returning, by the tourniquet; the result being that the part below the tourniquet becomes comparatively bloodless.

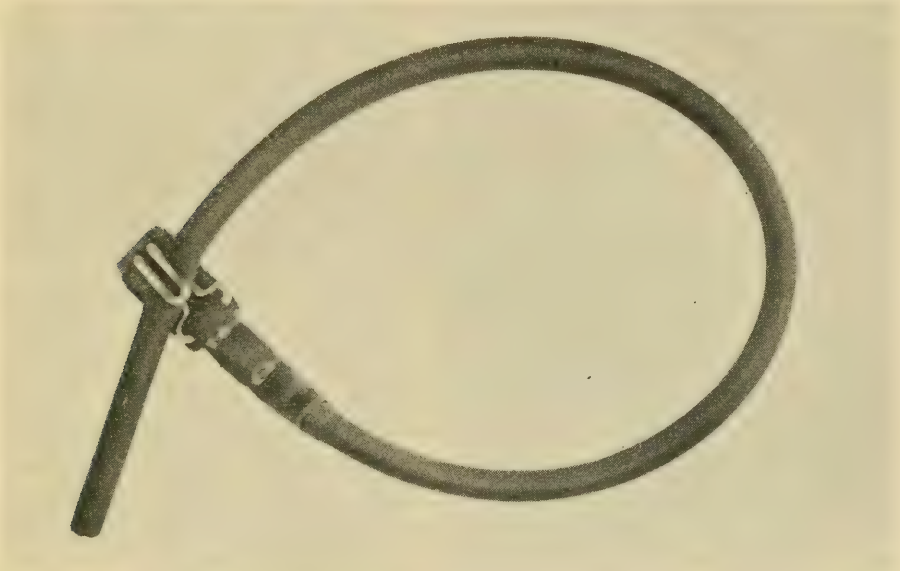


Fig. 174.—Arnold's Reliance Tourniquet.

If the operation has to be performed higher up the limb, the bandaging can be continued by the use of a second bandage of the same kind. Although a bloodless condition of the part may appear at first glance to be a great advantage, especially to an inexperienced operator, "it has serious drawbacks, when the wound has to be made in a part which contains numerous and important blood vessels, because it greatly increases the difficulty of distinguishing arteries, veins, and nerves from each other. The operator is sometimes obliged to remove the tourniquet, in order to re-establish the circulation of blood, so that he may be able to find out the exact situation of the arteries, or to see what small arteries have been cut. Also, the use of a tourniquet and Esmarch bandage is apt to give rise to extensive bleeding

after the operation, when these appliances have been removed" (*Cagny and Gobert*).

I have already pointed out that the application of a tourniquet should be employed only for a short time; because destructive changes and finally death of the part will quickly ensue, if it be long continued.

Tracheotomy.

GENERAL REMARKS.—Tracheotomy is the operation of making an opening from the outside of the throat into the windpipe with the object of relieving obstruction to breathing situated above the opening; and may be temporary or permanent. The former is employed for acute difficulty of breathing which threatens the life of the animal; the latter, for chronic affections, such as roaring. As the opening has a constant tendency to become closed, we are obliged, in order to counteract this effort at repair by the wounded tissues, to adopt some mechanical means, of which the best is a tracheotomy tube (Figs. 177 and 178). The use of a tube, which is a practical necessity in permanent tracheotomy, is optional in the temporary operation. We find that the greater the amount of damage (cutting through and removal of cartilage) inflicted on the windpipe in making the opening, other things being equal; the greater will be the probability of the wound causing injurious alterations in the shape and the calibre of the windpipe. Taking this fact into consideration, and bearing in mind that temporary tracheotomy is employed, with extremely few exceptions, only on horses which are at rest; we may conclude that, as a great rule, it demands a much smaller opening than permanent tracheotomy.

INDICATIONS FOR THE USE OF TEMPORARY TRACHEOTOMY.—The usual cases which demand this form of operation are those of laryngitis which produces swelling of the part (œdema of the glottis); abscess in or near the larynx; and choking. The opening may generally be allowed to close after about three days.

ADVANTAGES OF PERMANENT TRACHEOTOMY.—The relief obtained from the operation is often great and long continued. Leblanc kept a roarer at work by means of his tracheotomy tube for eighteen years. "Since the year 1872, I have used my tube with several roarers, among which were two that were employed at fast paces. With this apparatus, which is very simple and light, they were able to do their work as well as before they became roarers, and have continued to do it for the past four years. Several

other practitioners have got equally favourable results" (*Peuch*). Tracheotomy has enabled many horses, especially steeple-chasers, to win races. In one cross-country race a few years ago, all the "placed" horses carried tubes in their throats. On the other hand,

Fig. 175.—Improvised tourniquet.

Fig. 176.—An Esmarch bandage on foreleg of horse.

we cannot get over the fact that in the majority of cases, the full action of the relief, as would be required in racing, lasts for only a comparatively short time; and very rarely, if ever, restores the horse's "form" to what it would be, were he sound in wind. That

well-known steeple-chase horse, The Continental, may be cited as a comparative exception; though even in his case, the tube failed to render the breathing normal.

DISADVANTAGES OF AND CONSEQUENCES FROM PERMANENT TRACHEOTOMY.—The wound must of necessity set up to a greater or less extent, diseased changes in the bronchial tubes and lungs on account of the putrid discharge which drops from it into the windpipe. The presence of the tube, especially if the instrument be unduly heavy and its branches inordinately long, is liable to irritate and inflame the windpipe, with consequent ulceration of the mucous membrane, diminution of the calibre of the windpipe from thickening of the mucous membrane and underlying tissues, ossification of the rings of the windpipe in the neighbourhood of the opening, and formation of tumours. The air that goes through the tube, lacking the natural preparation afforded by a transit through the air-passages in front of the opening, is apt to have an irritating effect on the bronchial tubes and lungs, especially during cold weather, and when the organs of breathing are violently called into play. The presence of an open tube affords a ready means of entrance, into the bronchial tubes, of dust and other irritating matters. A horse which wears a tube will always be exposed to the danger of injury from his rubbing the tube, or from its catching on some object. The special precautions which have to be taken with such an animal, militate against the value of the operation in inverse proportion to the amount of attention which can be bestowed on the patient. We must not forget that the relief in breathing from tracheotomy experienced by the roarer, in no way cures his nervous complaint, which in many cases appears to injuriously affect the general nutrition of the body, as well as the implicated muscle or muscles of the larynx.

INDICATIONS FOR PERMANENT TRACHEOTOMY.—As a rule, permanent tracheotomy answers fairly well for a time with "noisy" race-horses and chasers; provided that their "class," independently of their infirmity, was considerably higher than that in which they are intended to compete. As a great rule, tube-bearers can succeed only among selling platers. I would not recommend the operation for ordinary horses which are roarers, unless their infirmity seriously impairs their efficiency. Owing to the nature of the work, the season of the year during which it is performed, and the danger of foreign bodies getting into the windpipe *viâ* the tube, when out with hounds for several hours; permanent tracheotomy does not always answer well with hunters, which, being animals of luxury, cannot with any degree of propriety

bear such a grievous disfigurement as the employment of the tube necessitates. As horses intended for the turf, whether on the flat or over a country, are required to exert their powers to the utmost only at comparatively long intervals, and during short spaces of time; permanent tracheotomy will generally succeed better with them, than with other classes of horses, if the precaution be observed of opening the tube only when they are being run, or during fast training gallops. In fact, some trainers of tube-bearing horses consider, as a result of their experience, that it is best not to open the tube, except of course for cleaning purposes, during training.

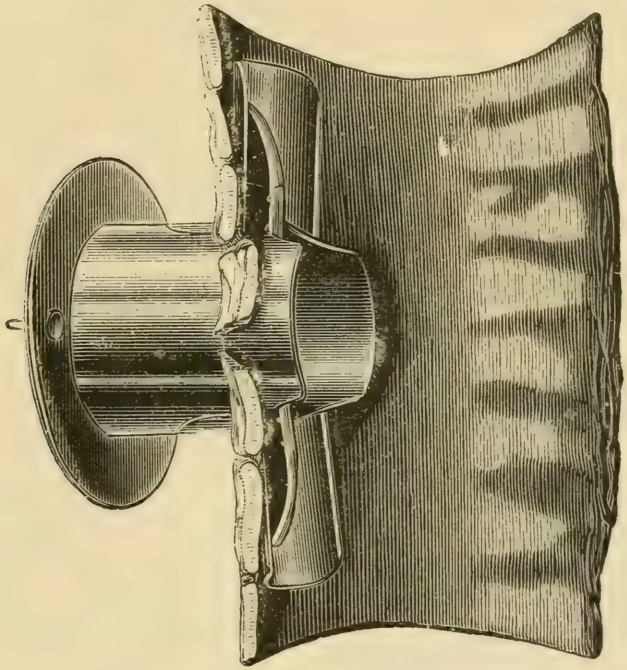


Fig. 177.—Jones' tracheotomy tube.

As observed by Möller, coarse-bred horses are more liable, from the use of the tracheotomy tube, to inconvenient, if not dangerous, diminution of the calibre of the windpipe from thickening of the mucous membrane and its underlying tissues, than thorough-breds.

TRACHEOTOMY TUBES.—The tubes most commonly employed consist of a "shield," which remains outside the opening; a body, which is in the form of a cylinder, and which rests in the opening of the windpipe; and an upper and lower branch (or arm), which prevents the tube from falling out.

The chief requirements in a tracheotomy tube are as follows:—(1) It should be as light as practicable. Here, the use of aluminium

is self-suggestive. Some authorities however state that aluminium is objectionable on account of its irritating the tissues with which it comes in contact. I regret that I am unable to decide this point. (2) It should, if of metal, as recommended by the late Mr. F. B. Jones, be made of only one kind of metal, so that no galvanic action be set up. (3) Evidently it should be of comparatively large calibre. (4) There should exist as little difference as practicable between the calibre of the opening in the windpipe and that of the tube, so that efficiency may be obtained with a minimum amount of damage to the windpipe. (5) The tube should be capable of being kept open or shut, as may be required. (6) It should remain securely in its place without requiring to be secured by strings, tapes, etc. (7) It should be easy to insert and remove. (8) It should offer as little impediment as possible to the passage of air to and from the air-passage above the opening. (9) Its mechanism should not be liable to get out of order, or to become clogged up by the action of the discharge. (10) Its component parts should have no tendency to become separated, or, in such a case, to fall into the windpipe. (11) The body of the tube should be of such a length that the shield can rest comfortably against the skin, without the skin and muscles which cover the windpipe being in any way compressed between the shield and the arms. Mr. Jones, who had great experience in the application of tracheotomy tubes, condemned the use of washers, which many place between the shield and skin, when the swelling caused by the operation has gone down. Their employment naturally interferes with the cleanliness of the part, and can be dispensed with by having two or three tubes of different lengths of body; provided, of course, that expense is no object. (12) The branches (arms) should be of such a form and length that while giving free passage to the air to and from the larynx, they will irritate the interior of the windpipe as little as possible. The larger the arms, other things being equal, the more liable are they to cause inflammation and ulceration of the interior of the windpipe.

CHOICE OF A TUBE.—Among English permanent tubes, that of Jones, and among Continental ones, that of Peuch (in aluminium) appear to be the best. Leblanc's tube has the advantage that its shield can be shifted either backwards or forwards on its body, so that, with it, there is no need to use washers to fill up the space between the skin and the shield, when the swelling caused by the operation subsides. Field's tube is a very good one for temporary use.

SITE OF OPENING.—For permanent tracheotomy, there are three conditions which regulate the position of the opening in the

windpipe. (1) It should be on a spot where the muscles covering the windpipe are not thick. (2) It should be sufficiently high, so as to allow of a second opening being made, in the event of changes (narrowing of the windpipe from distortion, ossification, etc.) occurring in the neighbourhood of the first opening which would interfere with the breathing. (3) It should be sufficiently low down to prevent the horse disturbing the tube in any way by drawing in his head (flexing his head on his neck). These conditions will generally be fulfilled if the opening be made at a distance of about 5 inches (Fig. 178) from the larynx. Mr. Jones advises

Fig. 178.—Position of tracheotomy tube.

that the operator should always see the horse ridden with the bridle he regularly wears, so as to observe the position in which the animal carries his head, and to find out if he is accustomed to arch his neck a good deal; for in that case the tube must be inserted lower down than otherwise.

In temporary tracheotomy, it is best to make the opening about half-way down the neck (that is, about half-way between the larynx and the breast); for, at that spot, the windpipe occupies a more superficial position than higher up, or lower down.

THE OPERATION FOR PERMANENT TRACHEOTOMY.—After having selected the spot on which to operate, secure the horse

by means of a twitch, reduce the sensibility of the part by injecting cocaine (p. 608), get his head elevated by an assistant, render the skin tense over the part by means of a finger and the thumb of the left hand, make in the middle line of the throat a longitudinal incision of from 2 to $2\frac{1}{2}$ inches in length, through the skin, and insert into the wound a pair of spring retractors to hold the edges of the skin open. On each side of the median line of the windpipe, excise with a narrow but strong scalpel a semicircular piece, out of two rings of the windpipe, after having guarded the resulting circle of cartilage from falling into the windpipe by passing through it a sharply curved needle threaded with wire, which is preferable to a material that might be liable to be cut through, if accidentally touched with the knife. The circular opening should of course be of the same diameter as the body of the tube which is to be inserted. In order to interfere as little as possible with the stability of the windpipe at the site of the operation, it is advisable to make the opening in the upper portion of one cartilaginous ring and in the lower portion of the ring immediately above it. Instead of trusting to a knife to make an opening of suitable size and shape, we should employ a tracheotome (that of Vandermarken for preference) with which we can cut out a circular piece of cartilage of the exact size we require. This instrument has an arrow-headed rod in the centre of its cutting surface, for insertion into the centre of the piece of cartilage which is to be removed, so as to prevent it from falling into the windpipe. Having removed the piece of cartilage, the parts should be thoroughly dried with a disinfected sponge (p. 70), or with a piece of antiseptic cotton wool; and the tube (which should have been previously disinfected) inserted. Performed in this manner, there will be but little resulting inflammation and swelling; and the horse will be ready for work in a few days.

THE OPERATION FOR TEMPORARY TRACHEOTOMY.—Here, instead of making a preliminary cut through the skin, we make with one bold incision a longitudinal opening into the windpipe; for experience teaches us that such a proceeding is followed by less bleeding and swelling of the part, than if two or more cuts were made. The tube, after having been disinfected, is inserted into the slit, which should have been made to correspond as nearly as possible with the size of the body of the tube. In this temporary operation we should of course refrain from removing any of the tissue, so as to allow the wound to heal up as accurately as possible, after the temporary tube has been taken out. The precaution of limiting the incision to the upper portion of one ring and the lower portion of the ring immediately above it, should here be

strictly observed; for if one or two rings be divided, the cut ends may, during the healing of the wound, overlap and thus cause more or less contraction of the windpipe with proportionate impediment to breathing. If we are unable to obtain a tube, we can keep the edges of the opening of the windpipe apart by means of a suitable cord passed through them with a suture needle, and tied on the top of the neck. When the artificial opening has served its purpose, no sutures or any special treatment will be necessary for the wound, which will heal up with remarkable quickness.

PRECAUTIONS TO BE OBSERVED IN THE USE OF PERMANENT TRACHEOTOMY TUBES.—(1) Before insertion, the tube should be thoroughly cleaned. (2) It should be allowed to remain undisturbed in the opening for a few days, so as to let the surrounding tissues accommodate themselves to its presence. (3) Subsequently, the tube should be removed every day, well cleaned and disinfected with a solution of creolin or pure carbolic acid in water (1 to 20), dried, and replaced. Here, the use of two similar tubes would be an advantage. (4) After the daily removal of the tube, the wound should be gently cleaned, and if necessary disinfected; care being taken that none of the antiseptic enters the windpipe. (5) Mr. F. B. Jones advises that "the plug should be taken out first thing in the morning and allowed to remain out all day to accustom the horse to breathe through the tube, and also for the lungs to get used to the fresh air. The plug should be put in only at night to prevent any foreign body getting into the windpipe, especially if peat moss litter is used in the stable. Previous to inserting the plug, it is advisable to rub a little of the antiseptic ointment (carbolic, iodoform, or salicylic acid ointment) round it, as it causes the plug to come out easily next morning, and prevents the mucus becoming hard round it." Although I am very loth to differ from such a high authority, I would advise, as I have already said, that with racehorses and chasers, the tube should always remain closed except during a race, or when a strong gallop is being given. (6) As remarked by Mr. Jones, no attempt to swim the animal should be made without first closing the tube. (7) If possible, we should have two or three tubes of different lengths, so as to obviate the necessity of employing washers when the swelling due to the operation has subsided. (8) In all probability it will be necessary, from time to time, to dissect away growths of tissue which may form inside the windpipe near the opening, and to enlarge the opening and calibre of the windpipe near the tube. In all such removals, we should take care not to allow any portion of the divided tissues to fall into the windpipe. Here, a sharp-toothed forceps will be useful.

TUBE FALLING INTO WINDPIPE.—There have been several cases of portions of the tube falling into the windpipe and being successfully extracted. On such an accident occurring, it will often be necessary to make a second opening as low down the neck as possible, in order to facilitate the removal of the offending body. We can perform extraction by means of a long forceps, piece of wire bent into the form of a hook at one end, or other convenient instrument. We may, by compressing the larynx of the animal with a finger and thumb, one on each side, make him cough and thus induce him to project the foreign body above the opening in the windpipe, at which moment an assistant should be ready to insert his finger into the opening, and, preventing in this manner the body from falling back into the lower part of the larynx, to take it out.

Trephining

is the boring through of a piece of bone. The operation is almost invariably confined to the bones of the skull or upper jaw, and is employed to give vent to diseased products which have accumulated in the sinuses of the head (p. 373), to relieve pressure on the brain, to facilitate the removal of back teeth, etc. It is most conveniently performed by means of a trephine, which is a circular saw made for the purpose. The operation is fully described in Peuch and Toussaint's "Chirurgie Vétérinaire."

Twitching.

The ordinary twitch is a staff about two inches in diameter, two or three feet long, and furnished with a loop of cord which is passed through a hole bored at one end of the stick. The thickness of the cord should not be less than that of the little finger of an ordinary man's hand, and should be made of soft material so as not to cut the horse's skin. The loop should be made large enough to freely admit the hand.

The best plan for applying the twitch (Fig. 179) is for the operator to pass his right hand through the loop of the cord, grasp the off side of the head collar or halter with the left hand, gently take hold of the muzzle with the right hand, and make over the stick of the twitch to an assistant, who should twist it round steadily, until the animal's muzzle becomes tightly squeezed by the cord. When thus fixed, the horse will generally keep quiet during ordinary operations; for, if he makes any movement, he will be severely hurt by the twitch.

This instrument may be easily improvised by placing a loop of cord round the muzzle and tightening it by a stick passed

through it, and then twisted round and round until sufficient compression is obtained.

The twitch is sometimes put on one of the ears; or round the lower jaw, under the tongue, and over the bare space of the gums (interdental space). The first-mentioned operation is objectionable, because it is apt to make the horse, for the rest of his life, unwilling to have his ears touched; and the second, because it is liable to hurt the mouth and render it unfit for the bit for a long time. I need hardly caution my readers against applying

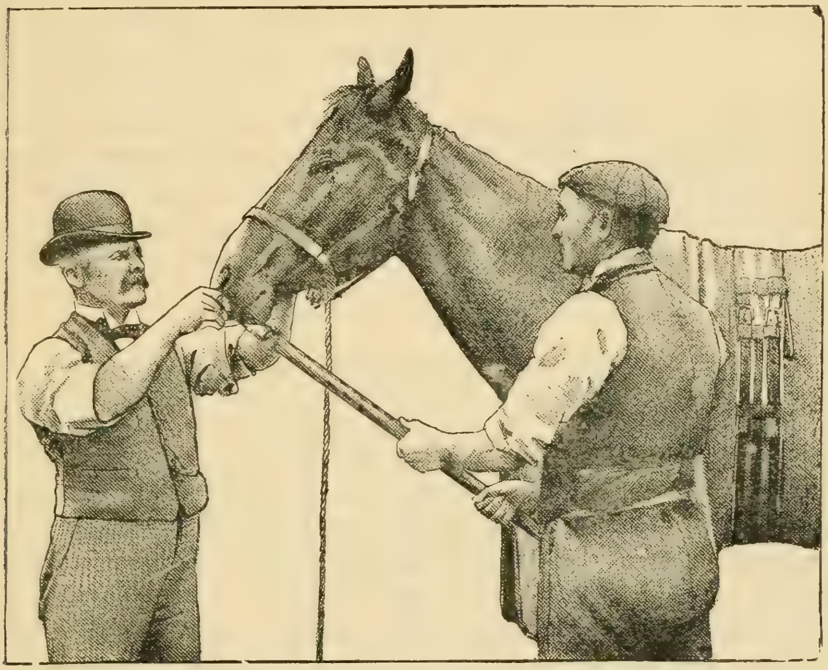


Fig. 179.—Applying the twitch.

the twitch to the tongue, which has frequently been horribly mutilated and even torn out by this barbarous practice.

In "Illustrated Horse-Breaking" I have described, with illustrations, other methods of twitching which are free from the grave objections possessed by the ordinary plan, of rendering horses subsequently shy of being bridled or otherwise handled about the head; and of keeping the animal in a continued state of pain, the whole time the twitch is on. These methods, which are particularly applicable to breaking, are not quite so effective in veterinary operations as the employment of the ordinary twitch; but are sufficient for all cases in which unusual severity is not required.

CHAPTER XXX.

Soundness.

DIFFERENCES OF OPINION AS TO SOUNDNESS—DEFINITION OF UNSOUNDNESS—PRACTICAL SOUNDNESS—MODIFYING CIRCUMSTANCES—DUTIES OF VETERINARY SURGEONS WHEN EXAMINING HORSES—CERTIFICATES—PRICE—SPECIAL WARRANTY—VICES AND BLEMISHES—ABSOLUTE UNSOUNDNESSES—DEFECTS WHICH ARE NOT NECESSARILY UNSOUNDNESS—HEREDITARY UNSOUNDNESS.

Differences of Opinion as to Soundness.

The want of unanimity of opinion, even among members of the veterinary profession, as to what constitutes and what vitiates soundness, has always been a fertile cause of dispute in horse cases. Some practitioners refuse to give a certificate of soundness, unless the animal is absolutely free from any physical ailment; and consequently they rarely, if ever, find a horse that comes up to their ideal standard of perfection; while others "pass" horses which are fairly useful, but which possess some defect or other that has been decided in court over and over again to be a breach of warranty of soundness. When an owner submits a horse for examination, he has a right to expect that the veterinary surgeon, when giving his opinion, will be guided by the principles which are recognised by legal tribunals; for it would be intolerable that any private individual should attempt to constitute himself a legislator on a subject of such widespread importance as this is. However much we may desire to eliminate causes of dispute as to soundness, we can do so only in the matter of laying down principles; for the existence of defects, and their influence on the usefulness of an animal, are questions which cannot fail at times to give rise to diversity of opinion. The fact that it is impossible to define unsoundness or soundness so accurately as to exclude all chance of cavil, is of but little practical importance, so long as we can obtain a good "working" definition which shall meet our

everyday requirements. A similar objection might be made to hundreds of universally-adopted definitions which thoroughly fulfil their purpose; although, from their nature, they are not entirely comprehensive.

Having agreed as to what unsoundness is, we may endeavour to classify the various diseases and structural defects, under two heads, namely: those which constitute absolute unsoundness, and about which, on that account, there can be no dispute; and those which cause unsoundness, only according to circumstances. In English law, there is no such thing as a legal unsoundness; the province of the law being limited in this instance to the establishment of the principles by which disputed points have to be decided. Certain defects, however, have been so frequently ruled to be unsoundness, and are so universally regarded as such, that no doubt need be entertained respecting the fact, that the possession of any of them by an animal, would render it unsound from a legal point of view.

Definition of Unsoundness.

If a horse has any disease or alteration of structure which diminishes, or is likely to diminish, his usefulness from a working point of view, or if he has any malformation which renders him less than reasonably fit for present work, such a horse is unsound.

We may see from the foregoing, that soundness is a question not of disease, but of usefulness; a fact which is in accordance with the following ruling by Mr. Baron Parke in "Kiddle v. Burnard" ("Meeson and Welsby's Reports," vol. 9, p. 670):—"If, indeed, the disease were not of a nature to impede the natural usefulness of the animal for the purpose for which he is used, as for instance, if a horse had a slight pimple on his skin, it would not amount to an unsoundness; but if such a thing as a pimple were on some part of the body where it might have that effect, as for instance, on a part which would prevent the putting a saddle or bridle on the animal, it would be different."

The first part of the definition which I have adopted, is founded on that of unsoundness by Mr. Baron Parke ("Coates v. Stephens," "Moody and Robinson's Reports," vol. 2, p. 158), which is as follows:—"If at the time of sale the horse has any disease which either actually does diminish the natural usefulness of the animal, so as to make him less capable of work of any description; or which, in its ordinary progress, will diminish the natural usefulness of the animal; or if the horse has, either from disease or accident, undergone any alteration of structure, that either actually does

at the time, or in its ordinary effects will diminish the natural usefulness of the horse, such a horse is unsound."

A fault of conformation—"turned-out toes," for instance—which does not unfit a horse for present work, however much calculated it may be to do so in the future, is not unsoundness. If, on the contrary, it interferes with the horse's present usefulness, it is unsoundness. The following will explain this point:—"A defect in the form of the horse, which had not occasioned lameness at the time of sale, although it might render the animal more liable to become lame at some future time, was not a breach of the warranty" (Lord Chief Baron Abinger in "Brown v. Elkington," "Meeson and Welsby's Reports," vol. 8, p. 132). "The horse could not be considered unsound in law merely from badness of shape. As long as he was uninjured, he must be considered sound. When the injury is produced by the badness of his action, that injury constitutes unsoundness" (Mr. Baron Alderson, "Dickenson v. Follet," "Moody and Robinson's Reports," vol. 1, p. 299). Respecting the case of "Holyday v. Morgan" ("Law Journal," vol. 28, part 2, p. 9, New Series), which was an action for breach of warranty of the soundness of a horse that had the habit of shying on account of excessive convexity of the cornea, Lord Campbell, C.J., ruled as follows:—"I am of opinion that the direction of the learned Common Serjeant was wholly unexceptionable, being in effect that if the shying arose from malformation of the eye, that was unsoundness, although the defect was congenital. Although in the authorities cited, the cases of supervening disease and accident are not alone mentioned, yet it is not from thence to be assumed that the learned judges would have said that if a congenital defect had been found to exist, there would not have been a breach of the warranty of soundness, the defect being such as to prevent the animal from performing that which might be reasonably expected from him. Suppose a horse to be born blind or with a contracted foot, surely that would be a breach of warranty of soundness, although the deficiency or defect existed before the animal was foaled." Weightman, J.: "If the congenital defect had merely a tendency to produce unsoundness so as not to render the animal unfit for present reasonable use, the dicta cited might apply; but here the congenital defect had actually rendered the horse unfit for the reasonable use for which a horse may be employed. An actual defect is not the less unsoundness that it has existed from the birth." Erle, J.: "I think the direction perfectly right. The animal had a defect of vision which diminished his natural usefulness at the time of sale; that, I am of opinion, was a breach of warranty; and I dissent from the proposition that no congenital defect can come within the definition

of unsoundness." Hill, J.: "The true test is, whether the defect complained of renders the horse less than reasonably fit for present use; and it is immaterial, if there be such a defect, whether it be congenital or of more recent occurrence." "I have always considered that a man who buys a horse warranted sound, must be taken as buying for immediate use, and has a right to expect one capable of that use, and of being immediately put to any fair work the owner chooses" (Mr. Baron Parke in "Coates v. Stephens," "Moody and Robinson's Reports," vol. 2, p. 158).

Practical Soundness.

The term, "practically sound," although it has no legal significance, may be applied for convenience sake to a horse which is capable of doing a fair amount of work, although he possesses one or more defects which might constitute a breach of warranty, if a warranty of soundness had been given. The defects in question may be absolute unsoundnesses in themselves, or may be open to opinion on that point. Thus, if a veterinary surgeon on examining a horse, found that he had a thrush or curb, or had both of these ailments at the same time, or had a slightly enlarged fetlock joint, he might, very reasonably, state in his certificate, after mentioning the defects which he had found, that the horse was "practically sound;" supposing that the thrush was not an aggravated one; that neither the back of the hock, nor the fetlock-joint, exhibited any symptoms of recent inflammation; and that the animal's action was unimpaired. This expression, as we may see, is a very elastic one; is entirely a matter of individual opinion; and when applied to a horse, means that he is actually unsound, although to a modified extent. A few veterinary surgeons, who, I am glad to say, form an insignificantly small minority in the profession, use it to save themselves, even if the horse they are examining fulfils all the usual requirements; lest, perchance, he might reflect discredit on them by developing, in the future, some form of unsoundness which they, at the time, were unable to discern. It is evident that if a man can find nothing in a horse which interferes, or is likely to interfere, with its usefulness, he is conscientiously bound to pass the animal sound, without making any selfish reservation; and that, if he shirks the responsibility of his position, he does wrong in taking a fee for work he has not faithfully performed. As a rule, the more experience a practitioner has had, the broader view will he take about soundness in horses, few of which are free from some trivial defect or the other, with which a person inclined to be hypercritical, might not find serious fault.

Modifying Circumstances.

In deciding on the importance of any defect, apart from its own gravity, we should take into consideration the purpose for which the animal is intended; the work he has been doing; his age; and any signs of former treatment which he may show. Thus, a splint, in the case of a four-year-old which had evidently been idle for some time, and which was intended for fast harness work, should be regarded far more seriously than a similar one on the leg of an aged, heavy cart-horse which had been, up to the date of examination, in constant employment between the shafts; supposing that no lameness was present.

Again, when examining a horse, if we found his feet somewhat flat, and the frogs unusually large; the fact of the hoofs having been carefully filed, with the probable view of making them appear smooth and upright, might fairly influence us in rejecting the animal, on account of his presumed liability to fever in the feet. If we also observed that he had been bled from the coronet, or jugular vein, our doubt would be still further strengthened. Also, roughness of the hair over the back tendons and suspensory ligament, as indicating the application, on some previous occasion, of a blister, ought to redouble our attention as to the state of the underlying structures.

Duties of Veterinary Surgeons when Examining Horses.

A veterinary surgeon, when examining a horse, should confine himself to his own province, and should be careful to refrain from volunteering his opinion as to conformation, action, suitability to the purpose required, or any other matter, about which he is not professionally concerned. The position is of course altered, if the employer seeks the practitioner's advice on any particular point, or puts himself entirely in his hands. I think, however, the veterinary surgeon might with propriety, mention to his client any vices which the horse showed, while the examination was being conducted; although he would notice in his certificate, only those that might affect the animal's soundness; omitting, of course, such vices as buckjumping, jibbing, and rearing, for example.

Certificates.

A certificate should, for purposes of identification, clearly describe the horse which has been examined; should state his age, and all

the defects which he possesses, and which might be unsoundness; and should finally express the writer's opinion. It might, for instance, run as follows:

Address———
Date———

"I have examined to-day, at the request of Mr. Blank, a brown cart mare, five years old, called Nancy, the property of Mr. Dash, of the Greyhound Hotel, Banktown, Brookshire. She is fifteen hands three inches high; has a small star on her forehead; and white girth-marks on her near side.

"She has capped hocks; and has a splint on her near fore.

"In my opinion she is sound.

"A. B. Case, M.R.C.V.S."

If the animal possesses some defect which of itself constitutes unsoundness, this fact might be remarked upon, and the last two paragraphs might be merged into one, which might run as follows:

"She has capped hocks; and has a spavin on her off hind. She is therefore unsound."

Price.

Some practitioners erroneously think that they ought to be stricter about giving a certificate of soundness for a horse which, if passed, would be sold for a high figure, than for one of less value. They have, on the contrary, nothing to do with the animal's price, which is in no way a veterinary matter. The following remarks made by Holt, on "Broennenburgh v. Haycock" ("Holt's Reports of Cases at Nisi Prius," vol. 1, p. 632) refer to this point: "It was formerly, indeed, a current opinion, that a sound price was *per se* an implication of warranty. In other words, that a sound price given for a horse was tantamount to a warranty of soundness. But, when this notion came to be judicially examined, it was found to be so loose and unsatisfactory, and so much at variance with the principles of the English law in contracts of buying and selling, that Lord Mansfield [in "Stuart v. Wilkins," "Douglas's Reports by Frere," vol. 1, p. 18] rejected it as a popular error; and said, that there must either be an express warranty of soundness, or fraud in the seller, in order to maintain the action." See, also, "Parkinson v. Lee" ("East's Reports of Cases," vol. 2, p. 314). If, then, price has nothing to do with soundness, the veterinary surgeon who is concerned only with the question of soundness, should, we may feel assured, allow no consideration of price to influence him in his decision, as to the soundness or unsoundness of the animal he is examining.

Special Warranty.

"It is considered that horses with curbs may be passed as sound, on a special warranty being given, that, should the curb cause lameness within reasonable time (which time should be fixed), the seller should be responsible" (Oliphant's "Law of Horses"). With respect to the foregoing extract, I must say, that I cannot understand how the fact of the seller giving a special warranty can, with any show of reason, influence the examiner, who has nothing to do with any assertions made by the seller, or with any arrangement entered into between him and the buyer. In such a case, I venture to think that the better plan would be, for the veterinary surgeon to state, if so required, in his certificate, that the animal was unsound, solely on account of the defect in question. If the intending purchaser was then willing to take the horse, provided that he was guarded against any loss which might result from this particular form of unsoundness, he might accept a special warranty to that effect from the owner.

Vices and Blemishes.

Vices, even those injurious to health, such as crib-biting and wind-sucking, are held in law to be no breach of a warranty of soundness; unless they have actually produced in the animal in question, disease, or alteration of structure (see Baron Parke's ruling in Scholefield *v.* Robb, p. 564).

Blemishes are not unsoundness, unless they diminish or are likely to diminish, the animal's usefulness, from a working point of view.

Absolute Unsoundnesses.

I venture to put forward the following list of the best-marked and most common defects, the possession of any one of which, independently of any modifying circumstance, would render a horse unsound. I have compiled it with due regard to legal precedent, and to the general opinion of the veterinary profession, and have purposely omitted the mention of several diseases—inflammation of the brain, anthrax, lock-jaw, and influenza, for instance—which would evidently unfit the animal for work.

Asthma (p. 379).

Blindness, complete or partial.

Bog-spavin (p. 325).—Oliphant, in "Law of Horses," states that bog-spavin is an unsoundness. In the case of Argyll and Bute Lunacy Board *v.* Hugh Crawford (see "Veterinarian" for 1876, p. 58) the

same view was taken. Hence I think we should class this ailment as an absolute unsoundness; although, from personal experience, I would be inclined to disregard, in an aged horse, a small bog-spavin that was soft; free from any symptom of inflammation; did not increase in size, after exercise; and did not appear to injuriously affect, in any way, the animal's action, even when he had cooled down after severe work.

Bone-spavin (p. 252).

Breakdown.—This term is applied by veterinary surgeons to rupture of one or both branches of the suspensory ligament (p. 36), an accident which causes more or less descent of the fetlock joint. It is, however, popularly used to denote any violent sprain of the suspensory ligament or back tendons.

Broken-wind (p. 377).

Bursatee (p. 145).

Canker (p. 169).

Capped elbow (p. 334).—I would, in all cases, consider this an unsoundness; for however trivial it might be in itself, the enlargement would always be liable to become aggravated by the pressure of the heel, when the horse is lying down, and its presence would suggest special liability on the part of the animal to contract this injury.

Capped hock, synovial (p. 332).—This somewhat unusual form of capped hock is due to enlargement of the synovial bursa which lies between the point of the hock and the tendon that is attached to it. "It is an unsoundness, causing lameness, and sometimes the formation of abscesses from caries of the summit of the os calcis" (*Williams*).

Capped knee (p. 330).—Any swelling about this important joint could hardly fail to injuriously affect the animal's usefulness.

Cataract (Higgs *v.* Thrale, cited by Oliphant in "Law of Horses"). —The slightest opacity in either the lens or capsule is an unsoundness, as it is liable to interfere with the sight, and is always liable to spread. See p. 343.

Cord, scirrhous (p. 122).

Cornea, undue convexity of, so as to cause shying (p. 696).

Corns (p. 220).

Cough (p. 372).

Curb (p. 52).

Docking, wound by.—A horse recently docked should not be passed sound, until the wound has healed; for serious consequences (tetanus, for instance) may attend this operation.

Dropped hip (p. 308).

Elephantiasis (p. 508).

Eye, diseases of the (p. 339).

False quarter (p. 182).

Farcy (p. 489).

Fistulous withers (p. 106).

Founder (p. 184).

Glanders (p. 489).

Grapes and grease (p. 154).

Grogginess is a slang expression for navicular disease (p. 206).

Hernia (p. 283).

Hip, dropped (p. 308).

Horn tumours (p. 213).

Immobilité (p. 567).

Jaundice (p. 537).

Jugular vein, inflammation of, or blocking-up of the (p. 117).

Keratoma (p. 213).

Kumree (p. 543).

Lameness.—The most temporary kind of lameness is unsoundness, as long as it lasts.

Laminitis (p. 184).

Lateral cartilages, ossification of the (p. 276).

Lymphangitis (pp. 503, 505, and 506).

Mallenders (p. 161).

Mange, parasitic (p. 134).

Melanosis (p. 128).

Moon-blindness (p. 341).

Nasal gleet (p. 373).

Navicular disease (p. 206).

Neurotomy, effect of (p. 668). Chief Justice Best (Best *v.* Osborne, Ryan & Moody's Reports, p. 296) ruled, with respect to an animal on which this operation had been performed, that "a horse deprived of a useful nerve was imperfect, and had not that capacity of service which is stipulated for in a warranty."

Ophthalmia, periodic (p. 341).—This is a recurrent disease which in its ordinary course, terminates in blindness. A horse is therefore unsound if he is suffering, or shows any sign of having suffered from this disease.

Paralysis of the face (p. 568).

Paralysis of the loins (pp. 543 and 546).

Poll evil (p. 108).

Pumiced feet (p. 202).

Quidding is a symptom of some unsoundness which interferes with the swallowing of the food, either from inability to swallow ordinary food, as in sore throat, or from want of masticating power, as in diseases of the teeth. In the case of McQuaid *v.* Farley (Armagh Spring Assizes, 9th March, 1849, "Veterinarian" for 1849, p. 234), it

was ruled by Chief Baron Pigot—on appeal—that the fact of the horse turning out a quidder, on account of a broken molar tooth, was a breach of warranty of soundness.

Quittor (p. 226).

Rheumatism (p. 524).—If a horse has rheumatism, he would undoubtedly be unsound; but it is generally impossible to prove its existence, owing to lack of distinctive symptoms. In doubtful cases we might ascribe the unsoundness simply to lameness.

Ringbone (p. 249), whether "true" or "false," is an unsoundness; for in all cases the bony growth is in dangerous proximity to joint, tendon, or ligament, and is liable to become enlarged.

Ringworm, parasitic (p. 141).

Roaring (p. 380).

Sallenders (p. 161).

Sandcrack (p. 174).

Scirrhous cord (p. 122).

Seedy-toe (p. 201).

Sesamoiditis (p. 44).

Short sight.—So as to produce shying (p. 696); or to interfere with the proper performance of the animal's work.

Shoulders, wasted.—"Some dealers have no objection to horses with wasted shoulders if they go sound, as it is well known that they will perform their work well enough if not put to the plough. Notwithstanding this, I hold that it is an unsoundness in law, and that it always depreciates the animal's value. I have seen many young carriage-horses suffer from this form of unsoundness, resulting from working in the plough; but I cannot recollect one instance where they were rendered permanently unfit for carriage work" (*Williams*). Animals thus affected, if free from lameness, might be certified as "practically sound" (p. 697).

Side bones (p. 276).

Spavin, bone (p. 252).

Sprain of the back tendons, suspensory ligament, or check ligament; or alteration of structure in these parts due to sprain.—The alteration in almost all these cases will be manifested by thickening, lengthening, or shortening of the affected part. No distinction should be made, as regards the question of soundness, between sprain of tendon and sprain of its sheath.

Stringhalt (p. 549).

Thick wind (p. 392).—Atkinson *v.* Horridge, Oliphant's "Law of Horses."

Thrush (p. 164).

Unnerving ("Neurotomy," p. 668).

Villitis (p. 205).

Weed (p. 506).

Whistling (p. 380), or other abnormal sounds, which indicate diminution of the calibre of the air passages.

Withers, fistulous (p. 106.).

Worm in the eye (p. 344).—After the removal by operation, or disappearance of the "worm," the eye may recover its soundness; provided, if the cornea has been punctured, that the resulting scar does not interfere with the sight.

Defects which are Not Necessarily Unsoundness.

The following defects, unless when specially excepted, may or may not be unsoundness, according to circumstances; such as their nature and position, the age of the animal, and the description of the work demanded of it.

Broken knees (p. 97).

Brushing (pp. 87 and 90).

Capped hock (p. 333) "is not an unsoundness if not causing lameness, and arises generally from the horse striking the point of his hock against some hard substance. It very often indicates a kicker either in harness or in the stable, is unsightly when large, and depreciates the value of the animal" (*Williams*). The enlargement, so as not to be an unsoundness, should be small, and should present no symptoms, whatsoever, of inflammation. Such a capped hock never interferes with the usefulness of a horse.

Chapped heels.—See "Cracked Heels" (p. 705).

Contraction of the foot.—The term, "contracted foot," is applied to a hoof which is narrower than natural, from side to side, in comparison to its length. If the contraction is at the heels, the horse is said to have "contracted heels." If the foot is of the proper form, but is smaller than its fellow, the animal has what is usually called "odd" feet. If both feet are smaller than what is generally met with in horses of the size of the animal in question, the term "small," instead of "contracted," should be used with reference to them. A horse may have naturally narrow feet—like those of a mule—which should not be regarded as a sign of unsoundness; provided always, that the animal goes free and level, and shows no signs of disease. The same remark will apply to naturally small feet which are of the same size. Contraction of the foot, as a diseased condition, is often the result of navicular disease, which almost always causes the horse to go "upon his toe," and consequently throws the structures in rear more or less out of work. Formerly, contraction was erroneously looked upon as a

cause, and not as a result of unsoundness. "Contracted heels" are chiefly brought on by the horse going on his toe; by allowing the heels to grow too long; by improper shoeing; and by the practice of cutting away the bars and frog. We often find thrush associated with contracted heels. A veterinary surgeon would be extremely chary of giving a certificate of soundness to an animal with "odd" or contracted feet. See page 168.

Cornea, specks on the.—The cornea (p. 339) is not very unfrequently wounded by accident. The scar is at first of a bluish colour, but subsequently turns white; a fact which may afford some clue to the length of time that has elapsed since the wound was inflicted. On page 346 we see that the cornea is punctured in the operation for "worm in the eye." "The opacities are, only when sufficiently large, or when so situated as to interfere with sight, to be regarded as causes of unsoundness" (*Williams*).

Cracked heels (p. 154).—As regards the question of soundness, it matters little if we are unable to draw a sharp line of distinction between this disease, and "grease"; for any case of the former which might be classed as one of the latter would be an undoubted unsoundness. Although a slight roughness, or a few scabs at the back of the pastern or pasterns, as the case may be, might be passed over; still, if the general surface of the skin of the part be inflamed, even without being broken, the horse should be regarded as unsound; for such a condition is often difficult to remove, and may give rise to a great deal of inconvenience to the affected animal. In old standing cases, the fissures in the skin may apparently heal up all right; but as long as any thickening of the part, or inflammation in it, remains, the skin will be apt to become sore again on very slight provocation. If the skin be at all tender, or if there exist in it any scars from previous attacks of this inflammation, the ailment will be liable to assume an aggravated form, or to commence anew, as the case may be, if the animal be put to fast work, on account of the skin of the part being subjected to a greater amount of bending, and being more exposed to chill, than when the work was slow. The fibrous tissue which forms the white mark left by a scar, does not possess the same degree of elasticity and suppleness as the uninjured skin. Besides, when the skin is inflamed, it is but poorly supplied with lubricating fluid from the oil glands, and is then ill-calculated to resist the effects of severe and continued bending.

Crib-biting (p. 555).

Cutting (p. 90).

Eczema.—See "Skin Diseases" (p. 707).

Feet, brittle.—See "Sole, weak" (p. 707).

Filled legs from work.—If a horse is aged, I do not think that the fact of his legs being slightly "filled," or a little "worn," should be sufficient to cause him to be rejected on the score of unsoundness; provided that it did not in any way diminish his usefulness. To fulfil this requirement, the structures of the limb should show no unnatural heat or tenderness; the integrity of the tendons and ligaments should be thoroughly assured; and any slight fulness which may be present, should have no appearance of having been caused by constitutional disease or weakness. When a young horse shows signs of work, the case is, however, very different All such questions of soundness as those of filled or worn legs can, naturally, be decided only by the examining veterinary surgeon.

Firing, marks of.—Some owners, as a preservative measure, make a practice of firing the hocks of their young horses, in the event of their considering that these joints show signs of weakness. Arabs and other Eastern nations employ the hot iron in a rather indiscriminate manner as a remedy for various ailments, some of which, such as colic, may be but of a temporary nature. In all cases where we find marks of the firing iron, we should redouble our efforts to discover if there exists in the part anything which might militate against the soundness of the animal; but if we are unsuccessful in our search, we should not reject the horse because of the existing blemish, which in itself does not come under the definition of unsoundness.

Galls, harness and saddle.—See remarks by Mr. Baron Parke (p. 695).

Grunting (p. 391).

Herpes.—See "Skin Diseases" on next page.

Hoof, split.—See "Split Hoof" on next page.

Hoof, weak.—See "Sole, weak" on next page.

Ischium, fracture of tuberosity of (p. 309). In any case, the defect should be mentioned in the certificate.

Knees, broken (p. 94).

Legs, filled or worn.—See "Filled Legs" on this page.

Mud fever.—See "Skin Diseases" on next page.

Nettle-rash.—See "Skin Diseases."

Odd feet.—See "Contraction of the Foot" (p. 704).

Parrot mouth would, naturally, be an unsoundness or not, according to its degree.

Prurigo.—See "Skin Diseases" on next page.

Rat tails.—See "Skin Diseases."

Ringworm, non-parasitic.—See "Skin Diseases."

Sitfasts (p. 102).—Whenever (which would be almost always) the sitfast occupies such a position as would render it liable to be

irritated by the gear, it should be regarded as an unsoundness. See following paragraph.

Skin diseases and wounds.—Cases under this heading should be decided according to the principles laid down by Mr. Baron Parke (p. 695).

Sole, weak.—When this condition is a result of disease, it is an unsoundness; but when it is a congenital defect which does not cause lameness, it is not an unsoundness. "Mere defective formation, however, not producing lameness at the time of sale, is not, in my opinion, unsoundness" (Mr. Justice Cresswell, in Bailey *v.* Forrest, Carrington and Kirwan's Reports, vol. 2, p. 131).

Sore-shins (p. 246).—This form of bony deposit, unless when very exaggerated, seldom interferes with the animal's usefulness, after the inflammation has subsided.

Speedy cutting (p. 90).

Splints (p. 231).

Split-hoof (p. 183) may or may not be unsoundness, according as it does or does not injuriously affect the animal's usefulness.

Surfeit (p. 160).—See "Skin Diseases" on this page.

Tetter, dry (p. 161).—See "Skin Diseases."

Tetter, humid (p. 161).—See "Skin Diseases."

Thoroughpin (p. 326).

Tread (p. 90).

Warbles.—See remarks by Mr. Baron Parke (p. 695).

Warts.—See "Skin Diseases" on this page.

Weaving.—This is a vice; see p. 564.

Windgalls.—If a windgall is soft and fluctuating to the touch; shows no sign of inflammatory action; does not injuriously affect the horse's movements in any way; and does not become heated after work; its presence may be regarded as no detriment to the animal's soundness, especially, if the horse is aged.

Wind-sucking (p. 564).

Worn legs.—See "Filled Legs" (p. 706).

Hereditary Unsoundness.

The term, "hereditary unsoundness," is so frequently applied to diseases which, like roaring, spavin and sidebones, are acquired after birth, that I am forced to include under this heading several diseases, in which the only part played by heredity is that of predisposition, as for instance, by the transmission of faulty conformation (p. 254) and other causes (pp. 383 to 385). Bent fore legs, twisted pasterns, and excessive convexity of the cornea, being faults of conformation, are

often hereditary. Although acquired characteristics (p. 21) are not inherited, any form of unsoundness to which an animal might have been predisposed, on account of faulty conformation, should be looked upon in stud animals with considerable suspicion: for instance, in the case of a strained back tendon or suspensory ligament, if the horse was "light below the knee." This, however, would be a question which could be decided only after a personal inspection. The following list has special reference to stud animals.

Amaurosis (p. 348).

Bent fore-legs.—Under this term we may include the condition shown by some horses, of "standing over" at the knees, which is in many cases due to hereditary predisposition. The majority of breeders are rightly averse from using for stud purposes, animals which show this peculiarity. At the same time, it is quite certain that work or injury (*e.g.* falls) may induce it, and that it may also be caused by neglect in the management of the feet. However brought on, it ought to be looked upon as a grave defect, in the present connection.

Bog-spavin (p. 325).—If the hocks are well formed, this affection (as well as thoroughpin), when it exists to but a slight degree, may be overlooked. Its presence, however, in aged animals, unless when caused by some accidental sprain, is as a rule, indicative of faulty conformation of the part. Especially among heavy cart-horses, we find the influence of hereditary predisposition strongly marked in the case of bog-spavins and thoroughpins, the possession of either of which affections, if they were well developed, should be sufficient cause for the immediate rejection of an animal for breeding. Heavy entires, even with the best of hocks, are often apt to get them puffy, on account of straining them when covering.

Bone-spavin (p. 254).

Broken wind (p. 377).

Cataract (p. 343).

Contraction of the foot (p. 704).—The fact of one foot being smaller than its fellow, especially in the fore limb, and if the difference of size be well marked, would be sufficient cause for immediate rejection of an animal for stud purposes. It goes without saying, that any congenital deformity of the foot should be regarded in the same light.

Curb (p. 52).—The possession of a curb would always be of serious detriment to the value of a stud animal, and especially for breeding hunters, steeple-chasers, and chargers. It might, however, be overlooked in a race-horse of exceptional speed and stamina, like, for instance, St. Simon, who is faulty in this respect; for, considering the early stage at which race-horses are put to work, we ought to be more

lenient with them than with animals that are given more time to mature. Besides this, they are not put so much on their haunches, as are cross-country horses and troopers.

Laminitis (p. 184).—As far as my experience goes, the fact that a sire or dam having suffered from laminitis, even with grave changes in the feet, would not injuriously affect the shape of the feet of the offspring, and would not predispose the offspring to laminitis. At the same time we must remember, that a horse or mare with naturally weak flat feet (which would be ill suited to resist the causes of laminitis) would have a strong disposition to transmit the defective shape of feet to the foal.

Navicular disease (p. 206).

Ophthalmia, periodic (p. 341).

Ossification of the lateral cartilages (p. 280).

Pasterns twisted.—Here the toes are turned either in or out.

Ringbone (p. 249).—Any form of ringbone is a most objectionable defect in a stud animal.

Roaring (p. 380).

Side bone (p. 280).

Sight, congenital defects of; supposing, that they affect the animal's usefulness.

Spavin, bog.—See "Bog-spavin" (p. 708).

Spavin, bone.—See "Bone-spavin" (p. 708).

Splints (pp. 232 to 235).—Splints should be viewed with great suspicion in mares and horses which are reserved for breeding purposes; for the law of heredity is well marked in the tendency, possessed by some animals, to throw out bony deposits on the limbs, at and below the knees and hocks.

Thick wind (p. 392).

Thoroughpin.—See "Bog-spavin" (p. 708).

Whistling (p. 380).

CHAPTER XXXI.

Examining for Soundness.

First Stage.

Look at the horse while he is standing quietly in his stall, so as to observe if he points with either fore foot; stands in any constrained attitude; or shows signs of cribbing, wind-sucking, or weaving. We should also see if there is anything peculiar in his stable management which might indicate vice or infirmity. For instance, the side of the manger might be covered over with iron network, or some strong-smelling or bitter compound to prevent crib-biting. The horse might have on a side-stick or cradle to prevent him tearing his clothing; a crib-biting muzzle, or a strap round his neck to stop him from cribbing or wind-sucking; or hobbles, or a log, if he is inclined to kick, or to injure himself by continually pawing the ground with a fore foot; or he may have on his neck marks of a crib-biting strap. Bales of one kind or the other are sometimes used to prevent a horse which is that way inclined from kicking his stall or himself "to pieces" during the night. Arrangements for pulling the horse round, without getting in reach of his teeth or heels, will be sufficient to put the most careless observer on guard. For this important portion of the examination to be effective, the horse must be perfectly tranquil and cooled down from the effects of recent work, and must not have undergone the process of being "warmed up."

Second Stage.

We may now make the animal move over from one side of his stall to the other, to see how he bends his hind limbs; for symptoms of spavin or stringhalt are often best observed at this time. We must, however, guard against being deceived by any exaggerated hind action, due to the horse being accustomed to stand in deep straw bedding.

Third Stage.

Put a plain snaffle bridle on the horse; turn him round in his stall; and examine his eyes, nostrils, and mouth.

EXAMINATION OF THE EYES.—In order to ascertain that the haw and conjunctiva (the membrane which lines the eyelids and covers the eyes) are in a healthy condition, we may open the eye in the following manner: After having "made much" of the horse, place a hand on his nose to prevent him from going forward, or catch hold of the lower lip if he wants to depress his head too much. Then, by means of the forefinger and thumb of the other hand, open the eyelids by pressing the ball of the eye into its socket. This causes the haw and a large amount of the inside of the eyelids to be shown.

To examine the eyes themselves, we may, first of all, look at them with a full stream of daylight coming in on them. They should then appear prominent, soft, clear, and free from tears and other signs of inflammation or irritation. They should show no intolerance of light, as might be indicated by their being deep-sunken; by the more or less closed condition of the eyelids; and by the haw projecting more than usual over their surface. The eyelids should be devoid of any unnatural fulness, and should not present that peculiar wrinkled condition which is characteristic of periodic ophthalmia. When an eye has suffered from an attack of this not very common disease, it looks dim, weak, and smaller than usual. Both eyes should be of the same size. Any excessive convexity or flatness of the cornea should be noted, with the view of ascertaining how it affects the sight. In testing for amaurosis (p. 348), we should try the sight of one eye by shading the other, and by gently moving the fingers of the disengaged hand close to the uncovered eye, taking care not to touch the eyelashes, nor to produce a current of air, which, by affecting the nerves of the part, might make the animal blink, and might thus convey a wrong impresion to our mind.

The eyes should now be examined by means of a candle, or small lamp, in a place from which all other light has been excluded; the object being to allow the pupil to dilate as much as possible, so as to expose to the utmost extent the interior of the eye. If this is not practicable, light coming from one direction only, such as from a top window or skylight, should be employed. Light reflected from white objects, such as whitewashed walls, a white waistcoat or shirt front, should be carefully excluded; for it would be apt to cause the production in the eye, of white images, the

appearance of which might interfere with the accuracy of the observer's scrutiny. The plan of examining the sight in the open air, while shielding the eye with the top of a black hat from the reflection of white objects, is far too rough a procedure by which to arrive at correct results. While covering one eye with the hand, and bringing the light close to the other eye, and then drawing it away, we should see if the pupil of the eye which is being examined contracts or dilates in a natural manner; that no part of the iris is adherent to the lens; and that the power of contraction and dilatation is the same in both eyes. Each eye should be examined separately; for one may be completely blind from amaurosis, and yet its pupil may obey the stimulus of light applied to the sound eye, although insensible to that falling on its own retina. While making this experiment, we should observe if the *corpora nigra* (the small brownish-black balls which are to be seen, principally, on the upper margin of the pupil) are regular; for it sometimes happens that one or more of them become torn away from the iris, and may consequently affect the vision. The cornea should be carefully examined, to see if there are any scars or opacities on it; and, while holding the candle or lamp a little to one side, and raised or depressed as the case may require, we should look through the pupil, and try to detect on the lens or its capsule any speck, the existence of which should be sufficient to cause the rejection of the horse for cataract. We may also regard the eye from one side, while holding the taper to the front. To further test the condition of the lens, we may hold the light a little to one side of the eye, and look for the three images of the flame that are to be seen in a healthy eye; the first and brightest being reflected from the cornea; the second and largest from the front surface of the lens; and the third, which is small, dim, and placed upside-down, from the back of the lens. If the flame be slowly moved from one side to the other, the first two images will follow the direction of the candle, while the third and reversed one will go the opposite way. If a cataract be present and complete, the third image will be absent. If it be only partial, the view of the third image will be found to be obstructed when the light falls on the opacity. The ophthalmoscope might frequently be used with benefit in the examination of the eyes of the horse. As its description is beyond the limits of this work, and as it requires practical instruction to attain facility in its use; I need not further allude to it here. In cases of doubt as to the condition of the lens, we may employ a magnifying glass. If it is necessary to dilate the pupil, we may place in the eye a drop or two of *liquor atropiæ sulphatis* (p. 601).

EXAMINATION OF THE NOSTRILS.—We require to open each nostril in order to examine the nasal passages, and to see that the mucous membrane shows the pink hue of health. No mistake should be made about the accidental presence of dust in the nostrils, which should be examined for ulcers, scars, polypi, irregularity in the calibre of the passages, and for the existence of any discharge. To open, say, the off one, hold the lower lip with the left hand, place the thumb and forefinger inside the nostril, and enlarge the opening by drawing them apart. The orifice of the lachrymal canal should be in a natural condition. It is found on the lower part of the nostril "near the point where there is a line of demarcation between the dark colour of the skin, and the rosy tint of the mucous membrane" (*Lecoq*). The false nostrils should be thin, pliable, and free from any thickening, injury, or results of injuries.

EXAMINATION OF THE MOUTH.—Open the horse's mouth and ascertain his age (see Chapter XXXII.). Observe that the teeth are regular; the tongue and lips in good working order; the mucous membrane of the mouth in a healthy state; and the breath, sweet smelling. A good way to open the mouth is as follows: While standing alongside the horse's near shoulder, catch hold of the head-collar or bridle (as the case may be) with the right hand; place the flat of the left hand on the animal's nose, clear of the nostrils; let go the head-collar or bridle; and seize the lower lip with the right hand. Then slip the left thumb down to the near corner of the mouth, and lift up with it the upper lip, so as to be able to take an external view of the incisors. The hold we have thus got of the lower lip will act as a fairly effective twitch, which we should use with discretion. To look at the tables of the incisors, we draw the tongue out with the right hand, placing it for preference between the third and fourth fingers.

Fourth Stage.

Examine the horse according to the directions in Chapter I., to see if he is lame. If he passes the ordeal at the trot, we may, while putting him to severe exertion, observe the state of his wind (pp. 387, 388 and 389). A certificate of soundness should on no account be given, as far as the wind is concerned, from the mere fact of the horse going through the grunting test successfully.

The horse should be tested for lameness, before "looking him over," lest the observation of any defect might bias our judgment as to the evenness of the animal's action.

Fifth Stage.

Have the horse placed on level ground with the attendant standing in front of him, and holding him straight with a rein in each hand. The examiner should then walk round, and look the animal carefully over. The following are the chief points which should be noted:—(1). That the horse stands in a sound, healthy attitude. (2). That his legs are properly shaped, and do not show "wear" sufficient to constitute unsoundness. (3). That he has got neither odd nor badly shaped feet. (4). That the look of his coat and his general appearance indicate good health. (5). That the movements of the flanks are natural, and do not give the impression that there is anything wrong with the "wind." (6). That the hips, or buttocks, are not "down;" no other portions of the pelvis displaced; and the vertebræ of the tail uninjured. (7). That the animal is free from sore shins, curb, and any "bow" about the back tendons. (8). That both sides of the body are symmetrical; and that there is no deformity, other than I have mentioned.

Sixth Stage.

Having previously examined the eyes, nostrils, and mouth, we should look over the face to see if there is any peculiarity on it, either from injury or disease. The "chin-groove," which is the smooth portion of the lower jaw, on which the curb-chain (when used) should rest, and the branches of the lower jaw, a little above this groove, should be examined for signs of recent injury, or for bony deposits resulting from an improper use of the curb. Although the fault may lie with the rider or driver, we may reasonably infer that a horse whose mouth has been pulled about a good deal will not be a pleasant "conveyance." Feel the space between the lower jaws for swollen glands, and observe if the skin over the larynx has a swollen appearance, and if there be any mark left from tracheotomy having been performed. Feel the poll for poll evil, and the space between the ear and the angle of the lower jaw on each side, for enlarged glands. Examine the ears to find out if they are all right. Run the hand along the crest to the withers, and see that they are free from wounds, soreness or old scars. If the mane hangs to the near side, it should be put over, to see that it does not conceal any wound on the neck. Examine the course of the jugular vein down the near side of the neck, for marks of "bleeding," and try if the flow of blood through it is unimpeded. See that the near shoulder is free

from "wasting" and harness-galls. If there be doubt as to the state of the muscles, the two shoulders should be compared with each other. We should observe that the near elbow is not "capped;" that the horse is free from girth-galls, and is not otherwise chafed. The amount of "wear" shown by the near leg; any "standing over" at the knee; or undue uprightness or unusual obliquity of the pastern should be carefully considered. The knee should be examined for signs of injury; the front of the cannon bone, for sore shins; the fetlock, for any swelling or undue roundness; the pastern, for ringbone or split-pastern; and the front of the coronet, for bony deposit on the upper part of the pedal bone, or for a diseased state of the coronet itself. Going to the back of the leg, we may see if the animal is free from mallenders; injury of the check ligament, back tendons and suspensory ligament; splints; marks of "unnerving" (p. 668), speedy-cutting, or of the use of a speedy-cutting boot; windgalls; a puffy condition of the fetlock; marks of "brushing"; thoroughpin of the fetlock; sesamoiditis; sprain of the ligaments at the back of the pastern; overreaches on the back tendons or heels; side-bones; cracked heels; and grease. We may now examine the coronet for quittor, marks of bleeding and firing, recently "sprung" sandcrack, tread, and false-quarter. If marks of firing be present, they will also be, as a rule, on the pastern. We may now feel the coronet and hoof to see that there is no unnatural heat in them, and that no throbbing or unusual fulness in the blood-vessels of the former can be perceived. In case of doubt, the state of these parts should be considered with reference to that of those of the off fore. We should compare both feet, to see that they are of the same size and shape. The wall of the hoof should be looked at for signs of inflammation of the feet, sand-crack, false-quarter, horn tumours, seedy-toe, and for fissure of various kinds. The horn should be sound and strong. Having picked up the foot, we should see that the heels are not contracted; the frog free from thrush, and well developed; the sole concave; and the ground surface of the foot healthy, free from wounds and signs of canker. We should note if the animal has had the "seat of corn" recently pared out; if he is shod in any particular manner which might indicate unsoundness or defective action; and if his hoofs have been filed with the object of concealing malformation or disease. If we suspect seedy toe, we may endeavour to test our supposition by tapping the outside of the hoof with a hammer. The practice of comparing one leg with another, should be followed in all cases, especially as regards the existence of sprain, "standing over at the knees," slope of the pasterns, and size of the feet. I have here purposely omitted the subject of navicular disease; for,

as far as I know, it presents no distinctive symptoms, its presence being generally characterised by "pointing," lameness, and contraction of the heels, all of which may be observed in other diseases. We may, however, strongly suspect that the horse has been treated for this very serious ailment (whether or not it had existed), if we perceive the mark left by a frog seton.

We should now run our hand over the back, to find if there are any warbles or sitfasts present. The ribs should be examined for fracture; the belly, for umbilical and ventral hernia; and the scrotum, for inguinal hernia, and for scirrhous cord in the case of geldings, and of rigs which have had one testicle removed. If the animal is a horse, we should note whether he is an entire, or a rig. We should try the points of the hips to see that they are not broken; and should look at the croup, pelvis, and tail for signs of fracture. It is well to remember that weakness of the muscles which raise the tail, often indicates injury or disease of the spinal cord. An open and flaccid condition of the anus, generally points to serious digestive derangement. The fact of the horse having been recently docked should be noted.

We should look at the stifle for signs of treatment for dislocation of the patella, and should examine the inside of the leg, between the stifle and hock, where the bone is but thinly covered, for wounds and bruises. We may then look for capped hock, curb, thoroughpin, bog-spavin, sallenders, bone-spavin, *jarde*, and the various ailments to which I have alluded, when describing the examination of the fore limb. While examining the near hind, we should not forget to compare it with the off hind, especially in cases of suspected spavin. Having done with the near hind, we may proceed to the off hind, and then, working forwards, finish at the head.

In making the foregoing observations, I have omitted many obvious points which the examiner could not fail to see, when going over the horse.

EXAMINATION FOR SHIVERING.—(See p. 567).

FEELING THE FORE LEGS.—The following neat method was taught by Professor Williams to his students at the New Veterinary College, Edinburgh:—To feel the near fore, for instance, the examiner, while keeping his knees straight, should run his right hand down the front of the leg with a light and moderately rapid touch. Then, turning round to the right, he should pass his left hand, in like manner, over the structures at the back of the leg. The suspensory ligament, which is more or less in the centre of the leg, as viewed sideways, will be felt in both operations. If only one hand be used, the impressions from the touch will not

be conveyed to the mind as distinctly as they would be, were both hands employed. If too much pressure be applied, or the hand be allowed to dwell too long in its course, an incorrect impression may, very possibly, be formed. It is a slovenly and somewhat ridiculous procedure to squat down and feel a leg with both hands, one to the front, the other to the rear, at the same time. When feeling the off-fore, the left hand should go down the front of the leg; and the right, the back of the limb.

EXAMINATION FOR HIGH PLANTAR NEURECTOMY, see p. 670.

EXAMINATION FOR MEDIAN NEURECTOMY.—When a veterinary surgeon is examining a horse, it is necessary for him to find out if this operation has been performed. On this important subject, Professor Hobday writes as follows in the "Veterinary Record" of 2nd April, 1898: "Whilst agreeing that the scar must be looked for, I do not think, from an experience of more than 150 median neurectomies, that if this exists it would be of any value to test sensation in or around the knee joint. One of the things which seem to surprise the "knowing" client most is that when tested in the usual manner with a pin or sharp instrument on the inside of the leg, the animal, in by far the majority of instances, still gives evidence of feeling the stimulus.

"In many cases, particularly in dark bay, brown or black horses, it is a matter of the greatest difficulty to find the scar, and in some instances I am sure that even the most careful examiner would pass it over if he trusted to that alone; but what is to be searched for in addition is the hole in the faschia covering the internal metacarpal flexor, this faschia having been cut through in order to expose the median nerve.

"Mr. Browning, M.R.C.V.S., one of the College tutors, was the first to make this observation in the Free Clinique, and now we always rely upon it. This hole can be felt, if present, by applying the point of the index or little finger over the region where the operation has been performed. It is rare for this test to fail to enable one to give a decided opinion, for if the space in the faschia is filled up by a small hernia of muscle tissue the latter yields on pressure, but if a neuroma blocks the way (and we have met with this in two cases), excessive pain is caused."

Seventh Stage.

Remove the shoes, and examine for corns, seedy-toe, bruises of the sole, and other ailments of the feet. Test the rigidity of the sole, and apply the pincers all round, to see if there is any soreness.

CHAPTER XXXII.

Shoeing.

NECESSITY FOR SHOEING—GROWTH OF THE HOOF—MECHANISM OF THE HORSE'S FOOT—WEIGHT-BEARING SURFACES OF THE FOOT—FORM OF THE HEALTHY FOOT—PREPARATION OF THE FOOT—THE SHOE—NAIL HOLES—FITTING THE SHOE—PUTTING ON THE SHOE.

Necessity for Shoeing.

Although saddle and light harness horses may do easy work without shoes on unmetalled roads in countries where the soil is exceptionally dry; it is practically impossible for them, in the great majority of cases, to perform even a fair day's task unshod on a macadamised track, especially if the ground is wet, as it usually is in England; for the horn of the hoof will become soft and pulpy, from the fibres absorbing moisture. In many parts of India, as in the indigo districts, horses which have good enough feet to do light work unshod on unmetalled roads during the dry season, have almost invariably to be sent to the blacksmith as soon as the rains commence. Not only has water a directly weakening effect on horn, but the hoofs of horses which are bred in damp climates are also softer and weaker than those of animals raised in dry climates. The enthusiasts who advocate the insane practice of working horses unshod in England, on the plea that use would confer the necessary strength on the hoofs, are ignorant of the fact that even those horses whose ancestors have for ages been employed without shoes in exceptionally dry countries, as in the Salt Ranges of the Punjab, have been proved, times without number, to be incapable of performing work on wet metalled roads, or even, in most cases, when such roads are dry, unless their feet were artificially protected. How, then, may I ask, could English horses, which are reared in our damp climate, and which have, naturally, hoofs of not half the strength and hardness of the Eastern animals, be expected to work unshod? When

we come to heavy draught labour, the idea appears still more preposterous; for we find that many of our cart horses actually wear through a greater thickness of iron, than there is horn secreted; so that, were we to endeavour to harden their feet by using them unshod, we should have to wait until the horn of their feet had become harder than iron, before our object would be attained! Again, I may ask, would shoes have been generally adopted, had not experience taught horse owners the imperative necessity for their employment under modern and civilised requirements?

Young horses require to be shod, or their shoes removed, oftener than older animals; because the horn of their feet grows faster. A three or four year old should generally have his shoes taken off every three weeks; though an aged horse may go a week longer.

Growth of the Hoof.

The hoof grows about 4 inches in the year. Usually, the yearly growth at the heels is about $\frac{1}{3}$ inch more than at the toes; but there are exceptions.

Mechanism of the Horse's Foot.

THE FOOT AS A LEVER.—I may explain to those of my readers who are unacquainted with anatomical mechanics, that the movements of the limbs are due to the action of muscles on bones.

A muscle (which is the lean part of meat) has the power of contracting in length on being stimulated by its nerves. Muscles are attached to bones, as a rule, by tendons, which are hard and inelastic continuations of their respective muscles.

If we regard the muscle which bends the foot and aids in raising it from the ground, we shall find that it lies at the back of the forearm; that it is attached at its upper end to the bones near the elbow, and at its lower end by a tendon (the *flexor perforans*, see Fig. 6) which runs down the back of the leg, at and below the knee; passes over the back of the fetlock; goes down the back of the pastern; and is finally attached to the base of the pedal (coffin) bone. This tendon forms one of the two well-known "back tendons." When the horse is standing at rest, both the tendon and its muscle are "on the stretch," by reason of the back of the fetlock pressing against the tendon. On the signal being given from the brain, the nerves of this muscle stimulate it to contract, and, on its becoming shorter, the pastern and fetlock joints are bent and the heel raised. If we look

from a mechanical point of view upon the action of this muscle, we shall perceive that we have a lever of the second order at work (Fig. 180). We have the *weight* (W) impressed downwards by the cannon bone; the *power* (P) acting upwards by the pull on the tendon due to the contraction of the muscle; while the *fulcrum* (F) is the ground at the toe. The relations of power and weight in a state of equilibrium, are:—

$$P : W :: WF : PF.$$

Hence the farther away the toe is from a perpendicular drawn

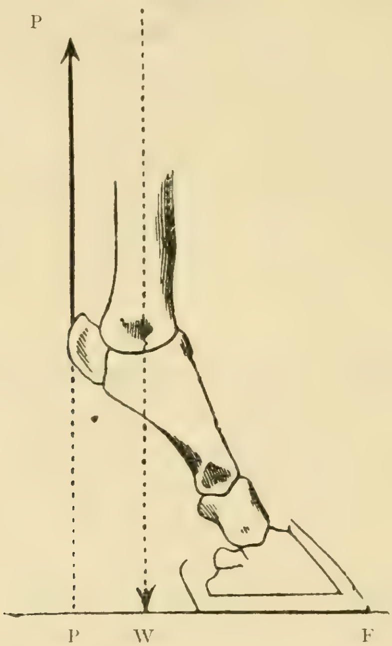


Fig. 180.—Mechanism of the Horse's Foot.

through the pastern joint (when the animal is standing at rest), the greater will be the strain thrown on the back tendons, both when standing still and during movement. From this we may draw the following practical deductions:—

(1) That the longer the hoof is allowed to grow (supposing the heel and toe to increase equally in length), the severer will be the strain on the back tendons; for the effect of this increased growth will be to still further remove the toe beyond the perpendicular which passes through the fetlock joint.

(2) A similar effect will be produced if the heels be lowered without reducing the toe, or if a shoe with a thick toe and thin heels be used.

(3) The strain on the tendons will be lessened if the reverse of the operations described in (1) and (2) be performed.

For the sake of simplicity of explanation, I have considered the action only of the *perforans* tendon, which, however, is aided by the other back tendon (the *perforatus*).

THE FOOT AS A SPRING.—Besides the action of the foot as a lever, it also serves as a spring; the mechanical advantages of the one being directly opposed to those of the other. Thus, the better the leverage, the worse the spring; and *vice versâ.* It is evident from the considerations already discussed, that the lower the heels with relation to the toe and the less upright the pastern, the greater freedom does the leg enjoy from concussion; although the power which it derives from the back tendons will work at a greater mechanical disadvantage.

Fig. 181.—Slope of 50°.

Fig. 182.—Slope of 55°.

COMPARATIVE LEVERAGE AND SPRING OF THE FORE AND HIND FEET.—Were there no such thing as injury to the limbs from concussion, we would naturally get the hoof as upright as practicable, so as to allow the back tendons to work at the greatest possible mechanical advantage. The bad effects of concussion have, however, to be provided for, especially as regards the fore-feet, which are much more liable to suffer from them than are the hind feet. It is impossible to determine with exactness the proper respective slopes of the fore and hind hoofs; but from an examination of a large number of feet which have never worn iron, I conclude that the former should be about 50° and the latter not less than 55° (Figs. 181 and 182). It is instructive to note that a considerable amount of power of propulsion is lost by the angle of inclination of the hind feet being too small; which condition is also a predisposing cause of spavin (p. 254). This is a practical point which is very important to owners, and especially to those who keep race-horses.

MEASURING THE SLOPE OF THE HOOF.—Fig. 183 will explain the action of a clinometer which I have devised for this purpose. It can be made out of a piece of wood, ivory, metal, cardboard, or other suitable material, and it is provided with a plumb line.

LOWERING THE HOOF.—If the foot is of the proper slope, but too long, it should be reduced equally at heels, quarters, and toe (Fig. 184). If the toe be too long, but the heels of right height, the toe should be lowered in a straight line to the heels, which should not be touched (Fig. 185); and *vice versâ.*

Weight-bearing Surfaces of the Foot.

The horn of the wall, sole, frog and bars is secreted by a membrane which, to borrow the words of Chauveau, covers a portion of the pedal bone and soft structures of the foot, like a sock; while the hoof acts the part of a boot. As this membrane is highly sensitive; the ground surface of the foot is constructed so that the necessary weight-bearing points may be obtained without injury to it. With this object, that portion of the sole which is immediately underneath the pedal bone, and which is protected by hard horn, is constructed in the form of an arch; for were it level, the membrane would, at every step, be in danger of becoming pinched between these two hard substances—the sole and the pedal bone. The weight-bearing surfaces, therefore, are as follows:—(1) the ground surface of the wall and that portion of the sole which is not directly underneath the pedal bone (see *a b* on right-hand side of Fig. 186); (2) the frog, which is endowed with elasticity, and which consequently can bear pressure without getting its secreting membrane hurt; (3) the bars, which are continuations of the wall. We may readily see that the weight-supporting functions of the frog, outer portion of the sole, and bars, should be fully utilised; for if the wall alone be subjected to concussion, the resulting strain on that portion of the secreting membrane which the wall covers, namely, the sensitive laminæ, may become so excessive, that laminitis may ensue. The weight-bearing surface at the toe is far broader than at the heels (Fig. 72, p. 217); for the slope of the foot is less, and the thickness of the wall greater, at the former, than at the latter. That portion of the sole—"the seat of corn" (Fig. 73, p. 221)—which lies in the angle formed by the wall and the bars, should on no account bear weight; because a part of the pedal bone is immediately above it, and the sole which covers it is very thin.

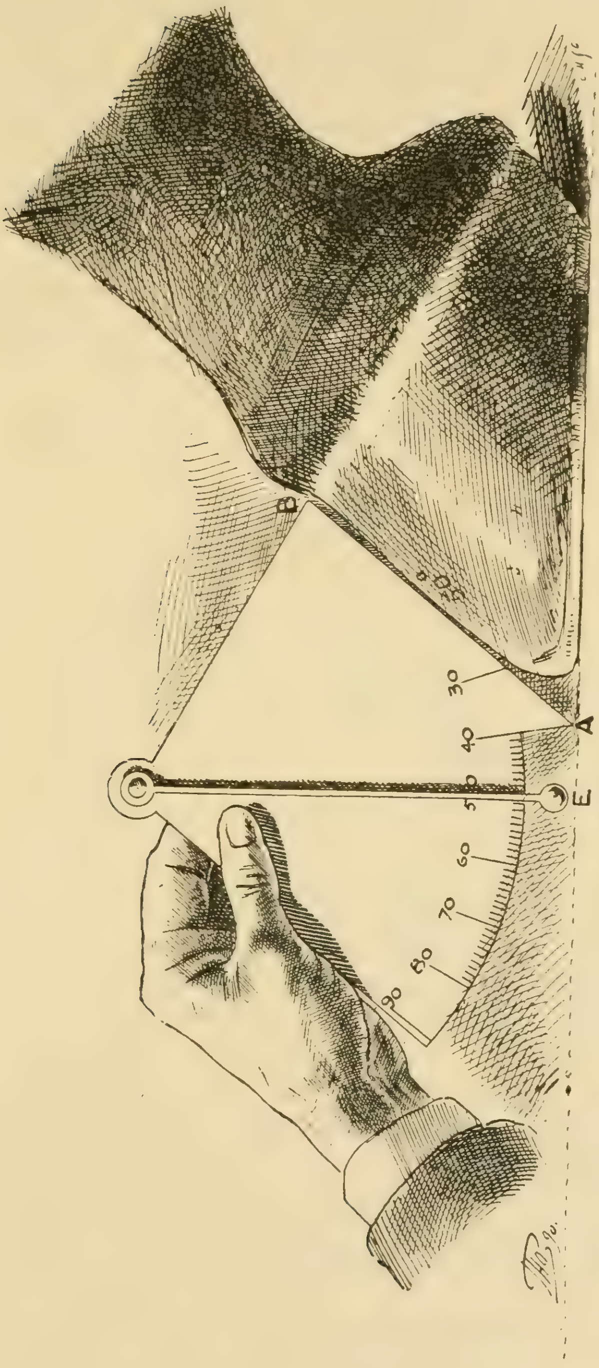


Fig. 183.—Measuring slope of hoof.

Consequently the secreting membrane above it, is particularly liable to injury.

If we examine the worn shoe of a normal fore foot, we shall find that it has sustained the greatest amount of wear a little to the outside of the toe and not in the exact direction of the long axis of the foot. In fact, the outside half of a normal fore foot sustains more wear than the inside half, an inference which we might draw from the fact that the horn of the former is thicker than that of the latter.

In order to meet the wear and tear to which the foot is subjected by contact with the ground, when the animal roams about under natural conditions, the horn of the wall is endowed with the property of growing to a practically indefinite length; though the horn of the sole and frog will not increase beyond a useful limit. The thickness of the sole is regulated naturally

Fig. 184.—Lowering hoof all round.

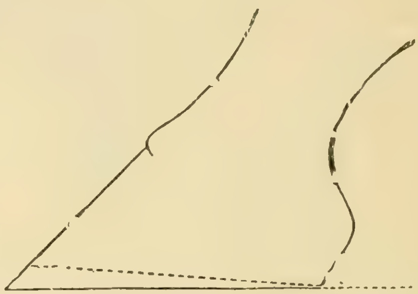


Fig. 185.—Lowering toe.

by its outer layers of horn exfoliating (flaking off), when the sole has reached its proper thickness. The frog cannot, under ordinary conditions, grow too long; firstly, because its outer layers, also, flake off; and, secondly, because it will stop increasing, as soon as it is relieved of pressure by reason of the more rapid growth of the wall. As we require, when shoeing, to utilise the whole of the weight-bearing surface at our disposal, as well as to preserve the horn-secreting membrane from injury; we may conclude that the sound parts of the frog and of the arched portion of the sole should be left untouched by the knife or other instrument, and that the wall and bars should be kept sufficiently "short," to allow the frog and outer portion of the sole, also, to support weight.

Form of the Healthy Foot.

1st. The frog is large (Fig. 49, p. 167) and comes well down on the ground, so as to act as a buffer in diminishing the effects of concussion, and also, by its form and nature, to prevent the animal from slipping.

2nd. The sole is thick, strong and arched.

3rd. On level ground, the weight-bearing surface of the foot is composed of the frog, wall, bars, and the outer portion of the sole.

4th. The slope of the fore foot, viewed in profile, will as a rule be about 50°; and that of the hind feet will be from 55° to 60°. This difference in obliquity between the hoofs of the different extremities, is due to the fact, that the hind feet are chiefly required for propelling the animal, and the fore feet for supporting his weight; hence, the wear of the former, at the toes, is greater than that of the latter. The slopes which I have taken for both fore and hind hoofs, are an average of those I have observed, from time to time, among a number of unshod

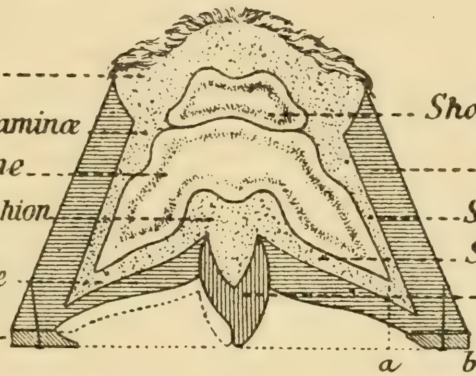


Fig. 186.—Vertical and transverse section of a hoof, the shoe of which is concave on the right side, and "seated" on the left side.

horses; for I have felt justified in assuming that, as the unprotected hoof readily wears down by friction with the ground, it will assume the slope best fitted for performing its functions.

5th. In the unshod foot the toe is rounded, as a result of wear.

Preparation of the Foot.

As the shoe ought to be employed simply as a protection against excessive wear of horn; it should be applied in such a manner that it will interfere, as little as possible, with the natural shape and uses of the foot. Hence, previous to its being put on, the hoof should be brought into a natural shape, as regards its slope and weight-bearing surfaces; except that the wall and outer portion of the sole should be reduced so as to allow for the thickness of the shoe. Although the horn of the hoof grows at about the same rate all round; still, when the animal is shod,

the shoe, being immovable at the toe, protects it from wear, but the heels are constantly battered down by the iron of that part. Hence, when the shoe has been on for some time, the toe will require to be reduced much more than the heels. As a rule, in order to allow for the thickness of the shoe, the toe will require to be lowered as much as possible, without, however, running any chance of making the horse "go tender." It is advisable, therefore, to begin by lowering the foot without touching the heels; and when the horn at the toe has been sufficiently reduced, we may see if we cannot lower the heels without injuriously affecting the slope of the foot. Usually, a good deal of confusion exists in the application of the terms "lowering the toe" and "shortening the toe," which, in its correct acceptation, means reduction of the length of the long axis of the hoof by vertical removal of horn at the toe. In lowering the toe, the removal is effected horizontally. Approval, in a general way, of the adage that we should fit the shoe to the foot, and not the foot to the shoe, ought not to blind us to the advantage to be obtained, in many cases, from increased leverage, by shortening the toe; that is, by placing the toe of the shoe further back than the toe of the hoof, and then rasping off the projecting portion of horn. This procedure is almost imperative in the shoeing of the hind feet of hunters, which are generally obliged to have the toes of their hind feet made "square," so as to diminish the risk of over-reaching. After the reduction of horn has been made, the weight-bearing surface of the wall and sole should be perfectly flat. Any "thinning of the sole," "opening out the heels," paring down the frog, or cutting away the bars, should on no account be allowed; beyond slightly easing off the "seat of corn" with the drawing knife, so that the shoe may not press on it, and removing any loose portions of the frog in order to prevent the lodgment of moisture, which would tend to rot the frog. In lowering the wall and bars it is perhaps safest to restrict the shoeing smith to the use of the rasp; although the drawing knife will be required to cut away any loose or undermined portions of the frog. Care should be taken that the heels and quarters are kept level. If the heels are unnaturally low, allowance should be made by the employment of thick-heeled shoes. "When the circumference of the hoof has at length been brought to a condition to receive the shoe, the rasp must finish its task by removing the sharp edge, and rounding it so as to leave a thick strong border not likely to chip. The unshod hoof nearly always exhibits this provision against the fracture of the wall-fibres" (*Fleming*). When a horse goes barefoot, even for a short time, this should also be done.

It was formerly a very common custom to mutilate the horse's

foot in various ways with the erroneous view of causing the heels to "open out," or to prevent them from contracting. An examination of the animal's foot shows us that the horn at the heels is secreted by the membrane which is wrapped round the ends of the wings of the pedal bone. Hence, it is impossible to really open out the heels without first fracturing the pedal bone. The horny heels undoubtedly "wire in," if they are allowed to grow too long; but this is a mere temporary condition. To use Professor Williams' words, the hoof is a "simple horny box" which neither expands nor contracts, as these terms are popularly understood. The foot, like all other structures, is, of course, liable to waste away from want of use; and it may be strengthened and enlarged by being well exercised, though not by any mechanical contrivances for opening it out.

The Shoe.

The following considerations should determine the shape of the shoe:—1st. The foot-surface of the shoe should be flat, as in

Fig. 187.—Section through a concave shoe.

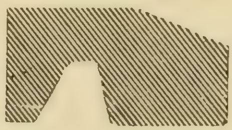


Fig. 188.—Section through a seated shoe.

a concave shoe (Fig. 187), so that the outer portion of the sole may aid the wall in bearing weight. *Seated shoes*, namely, those which are bevelled on the foot-surface (Figs. 188 and 189), are, for ordinary work, wrong in principle, and were invented in those barbarous times when it was considered correct to pare the sole so thin, that it would yield to the pressure of the thumb; hence, under this system, all weight had to be taken off the denuded sole. The bevelling of a seated shoe may be utilised for applying remedial agents to the sole in cases of disease or injury.

The use of seated shoes, especially when the heels are allowed to grow too long, increases the liability of the shod foot to "pick up a stone," by leaving an over-hanging edge of iron on the outer side of the depression between the heel and frog Such an accident is almost impossible with a *concave* shoe (ordinary hunting shoe) attached to a properly-prepared foot. If the sole has been thinned and the bars cut away, the picking up of a stone is apt, particularly when trotting down hill in harness,

to cause the horse to stumble and fall by the painful pressure produced on that part of the weakened sole which is in contact with the stone, when the animal puts weight on the foot. I have proved experimentally that, under ordinary circumstances, picking up a stone (supposing seated shoes are worn) will seldom cause a horse to go lame, provided that the sole and bars have not been mutilated. The extreme frequency of this accident being followed by lameness, shows that blacksmiths as a rule make far too much use of the drawing knife on the sole and bars.

2nd. In order that the frog may bear weight, the shoe should generally be as thin as practicable, consistent with its standing wear and retaining its shape.

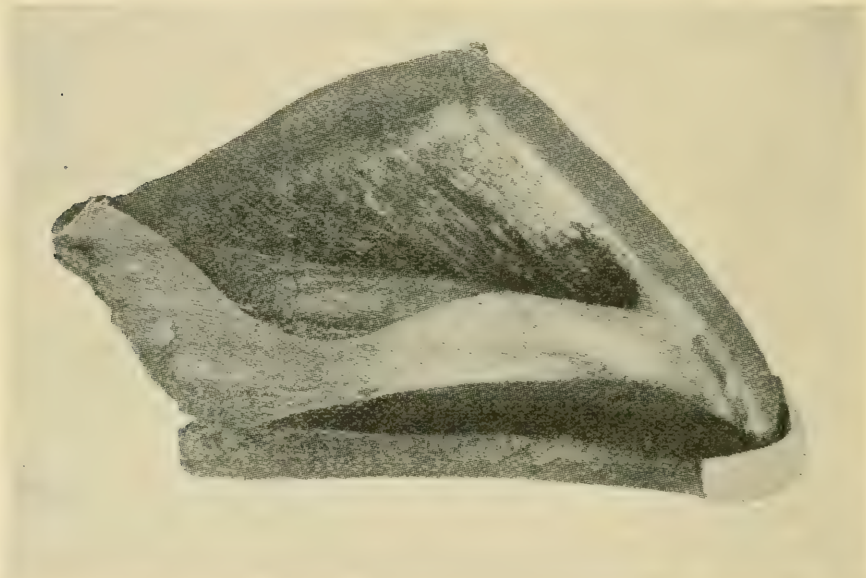


Fig. 189.—Section through a hoof shod with a seated shoe and having the sole pared out.

3rd. The shoe should, as a rule, be of a uniform thickness at the toes, quarters, and heels, so that the proper "bearing" of the foot be not disturbed.

4th. The shape of the foot-surface of the shoe should follow the general form of the weight-bearing surfaces of the wall and sole. Hence, it should be broad at the toes, and comparatively narrow at the heels; provided always, that at the latter part the web is broad enough to rest on the bars, as well as on the wall of the heels (Fig. 190). As the shoe is not fixed by nails at the heels, a little margin should be left, in the event of the shoe shifting, or of its heels opening out. If such a contingency happened without allowance having been made, the horn of the

heels would run the risk of becoming broken down, which would, of course, be most undesirable; for the shoeing smith will generally find considerable difficulty in keeping the heels of the hoof high enough. Narrow-heeled shoes, which are made to follow the shape of the ground-surface of the wall at the heels, and which are

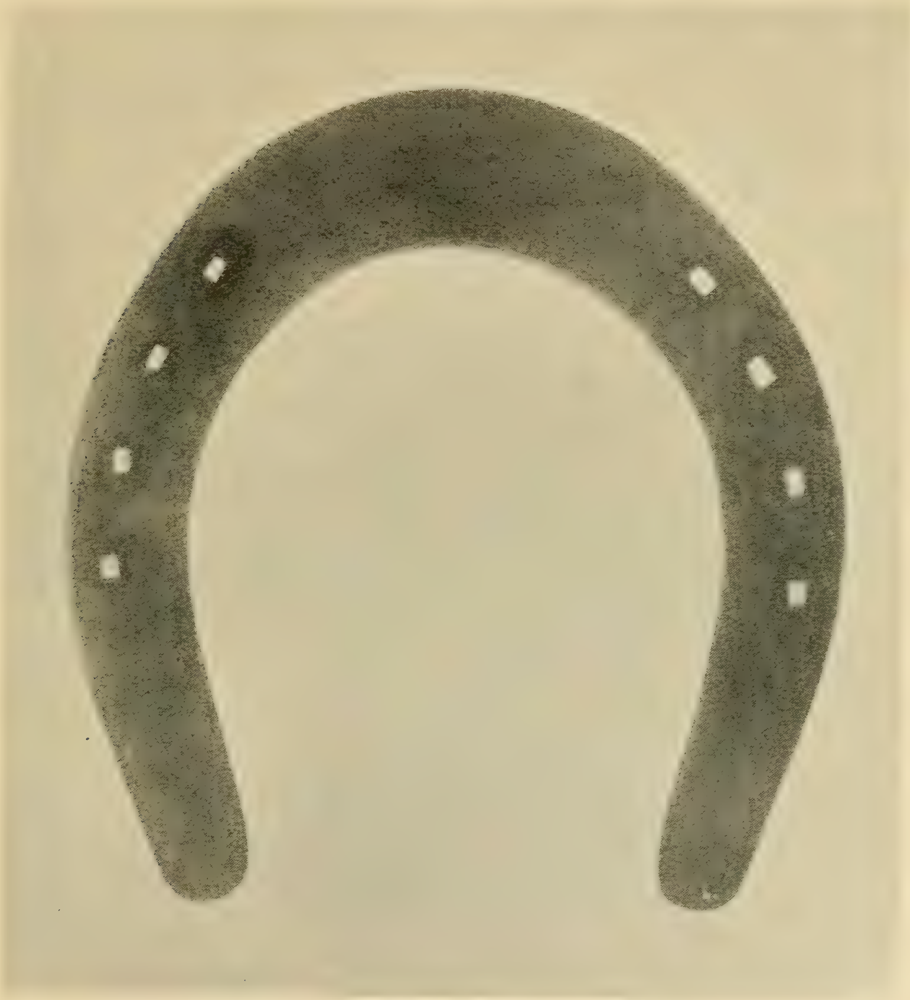


Fig. 190.—Foot surface of properly made shoe.

recommended by some authorities, appear to me to be wrong in theory; for they do not permit weight being borne on the bars. They are also defective in practice, on account of allowing no margin for accidental shifting.

5th. If it be intended to have a *clip* at the toe, an extra quantity of iron should be provided for it at that part, upon which falls the greatest amount of wear. Neglect of this precaution (as in the

case of making shoes out of iron bars of uniform shape and substance, Fig. 191) is the frequent cause of the fore shoes of saddle and light harness horses opening out at the heels, and thus necessitating a visit to the smithy before the proper time. Side clips help to prevent lateral rotation of the shoe, but toe clips have no effect in this useful respect. An experience of eighteen years among horses in India, in which country clips to shoes are very rarely used, convinces me that the employment of toe clips is by no means a necessity. Also my experience in England shows me that they are often a cause of foot disease, by exerting hurtful pressure on the toe of the pedal bone and its sensitive structures. The result of this harmful pressure can often be seen by a *post mortem* examination of the pedal bone, as in Fig. 192, which exhibits a deep depression at the toe of the pedal bone that was

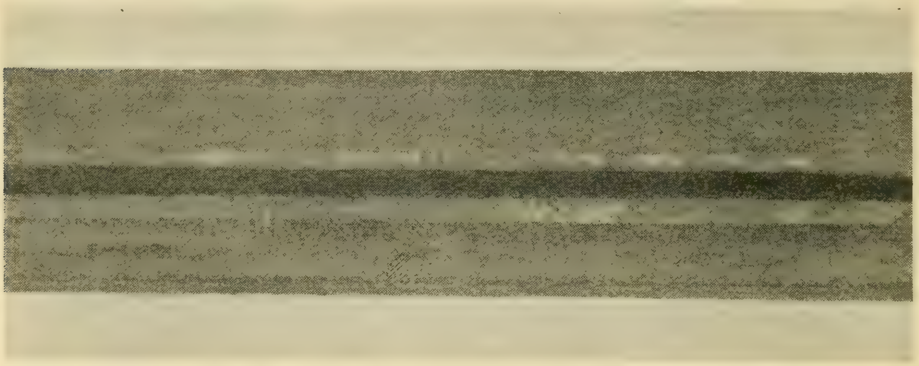


Fig. 191.—Foot surface of concave bar.

evidently produced by the pressure of the clip of the shoe. Here we have a potent factor in the formation of horn tumours (p. 213). The pedal bone in question had, on both sides, large side bones (Fig. 193), which were particularly well developed at the quarters (p. 276).

6th. When the heels of the hoof are unnaturally low, thick-heeled shoes may be employed.

7th. Care should be taken to make the heels of the shoes, on their foot-surface, perfectly flat; so that the heels of the hoofs may have no tendency to contract, on account of resting on surfaces which slope inwards.

8th. The shoes should be made to project slightly beyond the ends of the heels (without any risk being run of a fore shoe getting caught by a hind shoe), so that the heels of the shoe may rest on the solid pieces of horn that are found immediately behind the angle formed by the wall and bar. If the heels of

the shoe terminate slightly in front of these surfaces, they will soon become imbedded in the softer horn in front, and it will be impossible to keep the hoof at its proper slope, without using thick-heeled shoes. We may, however, get over this difficulty by using *tips*, which will leave the heels of the foot entirely

Fig. 192.—Excavation at the toe of the pedal bone as a result of disease.

uncovered. These tips should be flat on both sides, comparatively thin, and broad at the toes, so as to make up in strength for their reduced thickness.

9th. The ground-surface of the inner edge of the shoe should be bevelled (Fig. 187), in order to increase the foot-hold of the horse, to lessen the weight of metal employed, and to obviate the risk of picking up stones.

10th. In order to conform to the shape of an unshod foot which is in wear, the ideal horse-shoe should have, as in Fig. 71 (p. 213), a turned-up toe ("roll-toe" or "stumble-toe"). This arrangement, which is similar to that of the toe of a shoe which has been in wear for a considerable time, places the muscles which bend the foot (*flexor pedis perforans* and *perforatus*) and their tendons at a mechanical advantage, by reducing the distance between the fulcrum (F) and power (P) of the foot-lever (Fig. 180). It is almost needless to say that a shoe of the well-made pattern shown in Figs. 71 and 190, could not be easily constructed out of ordinary bar iron (Fig. 191). Either the shoe or the bars would have to be machine-made.

The use of too heavy shoes, not only causes the feet to carry an unnecessary burden, but it also necessitates the employment of large-sized nails, which are apt to injure the wall to an injurious extent.

The outer hind heels may have low *calkins*, and the inner ones may be thickened for ordinary hacks and trappers. I think, however, I am right in saying that, as a rule, such horses go safer, sounder, longer and faster, when their frogs are allowed to come on or near the ground, than when the ends of the shoes are turned down. If, however, calkins have to be employed, they should be made not more than a third of an inch in height, and the horn at the heels should be proportionately reduced. Calkins on the outer hind heels of the shoes of a 'cross-country horse, are often of great assistance to him in preventing him from slipping, when jumping. Heavy draught horses that are not required to go out of a walk, may have calkins on the inner and outer heels, both before and behind; though whatever contrivance is adopted, care should be taken that the natural slope of the foot is maintained. Hence, it is generally advisable with them, to apply at the same time, "toe-pieces," which will give greatly increased power, and will also allow the foot to preserve its natural slope. To obtain the advantages derived from the employment of calkins and "toe-pieces," we necessarily lose the benefit of frog-pressure.

If the shoe is not already bevelled, the inside edge of the ground-surface of the hind shoes at the toes should be rounded off, so that the horse may injure himself, as little as possible, in case he happens to over-reach. Hind shoes of 'cross-country horses generally have side clips, and the toes, as I have already said, should be made square—leaving an overlapping rim of crust at the toe, which should be rounded off with the rasp—in order to lessen the chance of over-reaching.

I cannot too strongly condemn the practice which is carried on in some forges, of invariably applying thick-heeled shoes. To

such an extent is this observed, in some instances, that I have frequently seen the heels of sound strong feet cut down, simply to suit these shoes, the habitual use of which is rarely necessary. The still more injurious practice of employing shoes thinner at the heels than at the toes, with the view of obtaining increased frog-pressure, has become obsolete; for it was found to cause an injurious amount of strain to be thrown on the suspensory ligaments and back tendons.

For ordinary saddle horses, shoes weighing from eight to ten ounces each, will be heavy enough.

In the foregoing remarks, I have confined myself to the con-

Fig. 193.—Sidebones particularly well developed at the quarters.

sideration of the ordinary shoe with certain modifications; as it is the most suitable one for general requirements. The Charlier shoe is only of historic interest; for all its advantages may be obtained with tips, which are free from its many drawbacks.

A *bar shoe* for a fore foot—to be used when the horse is at work—should be made heart shaped (Fig. 52, p. 177); so that it may not get caught by the hind shoe.

Nail Holes.

Thin shoes, especially if they be of soft iron, should be fullered; for if this be not done, and the nail be driven flush with the

ground-surface of the shoe, the nail hole will soon become too big for the head of the nail. If, however, the nail heads project beyond the ground-surface of the shoe, they will quickly get worn down, or knocked off; the result being, in either case, that the horse will drop his shoe. With a fullered shoe, though the heads of the nails are larger than the nail holes, they will lie protected in the groove.

If a shoe is made of hard iron and has plenty of substance, it should not be fullered; for if this be done, it will be difficult to alter the distance of the nail holes from the outer edge, if required. The holes should be punched square and to narrow downwards (looking at the shoe when the foot is "picked up"). "The square cavity, wide at the top, and tapering to the bottom, gives a secure and solid lodgment to the nail head, which, of course, should be of the same shape; it does not weaken the shoe, is easily made, can be placed near the outer or inner margin as required, and when filled with the nail is as capable of resisting wear as any other part" (*Fleming*).

Ordinary horse-shoes, as we are all aware, are made with the fullering at an equal distance from the outside edge all round the shoe; hence the nail holes have, of necessity, to be punched with little or no reference to the thickness of the horn which their respective nails are intended to pierce. This faulty method of fullering is a consequence of the adoption of the labour-saving plan of making shoes out of straight bars of iron, in which the groove that represents the fullering is parallel to the sides of the bar (Fig. 191). Supposing, therefore, that the farthest back nail holes are at the proper distance from the outside edge of the shoe, the nail holes in front of them will be too close to it; hence, to obtain sufficient hold for the nails, the shoeing smith will be obliged to set the shoe within the circumference of the wall, so that there is a rim of horn left round the fore part of the shoe, which rim, for the sake of appearance, has to be rasped down. We have here the explanation for the all-but-universal use of the rasp on the lower part of the wall, among ignorant shoeing smiths, who, having accepted a false system of fullering, are forced, in order to keep the shoe on, to fix it in a manner which necessitates the use of the rasp on the outside. Shoeing smiths who adopt this faulty system of fullering, obtain increased hold for the nails by directing the point of the nail more to the inside in the thicker portions of the hoof than in the thinner parts. I need hardly say that if, for convenience sake, the fullering has to be ready-made in the iron and if we do not wish the toes to be shortened (p. 726), it would be well to have the fullering marked out for each shoe, and made with reference to the

varying thickness of the hoof. A better plan would be, after cutting off the requisite length of iron from the unfullered bar, to fuller for each separate nail hole, and not to carry the fullering all the way round; for the more the shoe is fullered, the weaker does it become.

For a foot with a full amount of horn, $\frac{3}{10}$ths of an inch will be about an average distance that the nail holes should be from the outside edge of the shoe on its foot-surface: a little more towards the toes, and a little less towards the heels.

As a rule, the nail holes should not be punched before the foot is ready for the shoe to be applied to it; so that the smith may avoid the parts of the crust which may have been pierced by old nails, or which may have become chipped or split.

Fitting the Shoe.

The external margin of the shoe should accurately coincide with that of the hoof, except when the toe is shortened. If that portion of the shoe which is behind the last nail hole, be "set" within the outside edge of the wall, it will be very apt, from constant hammering on the ground, to become imbedded into the horn near the heels, which, as I have already said, will consequently become unduly lowered.

For horses used in ordinary light work, it is a clumsy and unworkmanlike practice to leave a large margin of shoe on the outside of the heels, so as to give the foot a false appearance of being open at the heels. It may, possibly, be advisable to do this with heavy cart-horses that have calkins to their shoes, in order to give them increased foot-hold.

If practicable, the shoe, in ordinary cases, should be fitted on at a red heat, and not when cold. The advantages of the former over the latter practice are as follows:

1st. The shoe can be put on in half the time.

2nd. Exact juxtaposition between the iron and the hoof is obtained, with, consequently, increased security.

3rd. The bearing surface of the wall and sole is rendered impervious to water.

4th. The charring of the horn renders the hoof less liable to split when the nails are being driven.

No harm can be done by shoeing hot, if the application of the hot shoe be limited to the indication of horny eminences. Even making a bed for the shoe by applying it at a red heat is unobjectionable, if there is plenty of horn left.

The heels should on no account be "sprung," that is, no space should be left at the heels between the iron and the horn; for

if this be done, the heels of the foot will be subjected to a constant process of hammering while the horse is in motion, and will consequently be liable to become battered down. Besides, grit and other substances will work in between the heels of the foot and the heels of the shoe. Corns may also be produced from the same cause.

Putting on the Shoe.

The nails should take a short, thick hold of the crust, and should not come up higher than one inch from its ground surface.

After the nails are driven, the rasp should not touch the crust, except to file, if necessary, a little of the thin horn from underneath the ends of the nails, so that the clinches, when they are turned down, may be properly supported; and, if required, to shorten the toe (p. 726).

The external surface of the wall of the hoof is covered by a thin horny layer (the periople), which gives it a smooth and polished appearance, and which also protects the fibres of the wall from the injurious effects of moisture, dirt, etc. This horny layer should therefore be preserved intact, as far as possible.

Unless a horse is inclined to brush, the clinches should not be filed down; and, then, only those on the inside quarter.

Before a nail is struck with the hammer in the first instance, it is held in the nail hole and inclined a little inwards, so that it may obtain a firm hold of the wall. Owing to the slight outward curve which is given to its point, it gradually inclines outwards, on being "driven."

CHAPTER XXXIII.

Examination of the Mouth for Age.

DURATION OF LIFE OF HORSES—MEANS OF ASCERTAINING A HORSE'S AGE—PARTS OF A TOOTH—DIFFERENT KINDS OF TEETH—FORM OF THE TEETH—STRUCTURE OF THE TEETH—CHANGES UNDERGONE BY THE TEETH WITH AGE—DATES OF TEETHING—CAUSES WHICH MAY HASTEN OR RETARD THE APPEARANCE OF THE PERMANENT TEETH—DATES FROM WHICH HORSES ARE AGED—TEETH WHICH RETAIN THE MARK AND CENTRAL ENAMEL BEYOND THE ORDINARY TIME—IRREGULARITY IN THE RESPECTIVE SIZE OF THE UPPER AND LOWER JAW—IRREGULARITIES IN THE TEETH—BISHOPING—ILLUSTRATIONS OF DIFFERENT AGES.

Duration of Life of Horses.

The chief difficulty in solving this question, is the fact that owners of domestic horses generally kill them, when these animals are past work, and records of the respective births and deaths of wild horses are seldom, if ever made. Goubaux and Barrier tell us that their *confrère,* M. Laurent, sent them the jaws of a horse which was 49 years old, and that in 1845 they saw a horse of the Cuirassiers, which had gone through the Russian campaign of 1813, and, on that account, was probably 38 years old. Mr. H. B. Hiles, M.R.C.V.S., most kindly sent me the jaws of a horse which was 42½ years old when he was destroyed by his owner, who had him for 36 years. The teeth of this animal are shown in Figs. 265, 266, and 267. I venture to say that 30 years is about the age limit of thorough-bred stallions which are kept in studs.

M. H. Bouley considers that high feeding, by hastening precocity, tends to shorten the life of animals. Friends of mine who have had long experience among horses abroad, inform me that horses which are brought up under natural conditions on grass, until they are at least 5 years old, live much longer than

those whose growth has been stimulated by corn. Also, Aristotle tells us that the life of stabled horses is much shorter than that of wild ones; and that mares live longer than stallions, which statement is corroborated by Hartmann. "Stallions, I understand from good authorities, do not live so long as cut horses, notwithstanding that the cut horse is cut for the very purpose generally of exposing it to hard work and toil and injuries of many kinds" (*P. Y. Alexander*).

Means of Ascertaining a Horse's Age.

I propose in this chapter to limit the consideration of the animal's age to the indications furnished by his teeth. Although these indications vary a good deal, they are sufficiently reliable for practical requirements. We may also determine whether a horse is old or young, by his general appearance; by the fact that the bones on each side of his nose "fall in," on account of the descent of the back teeth, as he gets older; and, in the case of a grey or roan, by the whitening of his coat. Almost all horses when well stricken in years, show white hairs, especially about the temples. The depth of the hollows above the eyes are, to a certain extent, a guide to the age of the animal; although these hollows may be prematurely deep in the stock of old parents, and possibly, in young horses which have suffered for a considerable time from debility. The curly condition of the tail seen in foals and yearlings, proves their youthfulness. These indications, except the last mentioned one, are too vague to be considered; unless we are unable to examine the mouth.

Parts of a Tooth.

The portion of a tooth which is outside the gum, is called the *crown*; the portion within the gum, the *root*; and the line of union between the crown and root, is termed the *neck*. The grinding surface of a tooth is called the *table*.

Different Kinds of Teeth.

A horse's teeth (Fig. 194) are divided into: *incisors* (front teeth or nippers); *canine teeth* (tushes); and *back teeth*, which consist of *premolars* and *molars*. The canine teeth occupy an isolated position between the incisors and back teeth, both of which are, respectively, close to each other. In the lower jaw, the canines are nearer to the incisors than in the upper jaw. The interval between the canines and the back teeth is called the

diastema, interdental space, or bar. Mares have teeth similar to those of horses, with the exception that the canines are almost always either absent or in a rudimentary condition (Fig. 247).

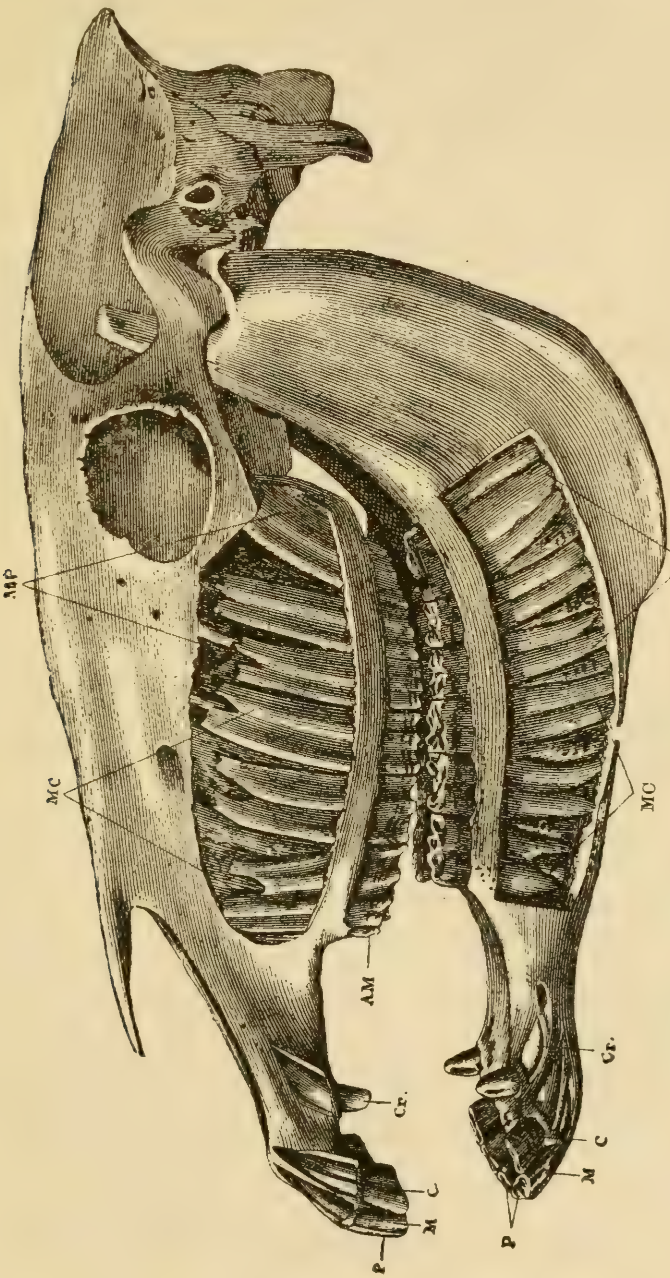


Fig. 194.—Teeth of the horse.
P, central incisors. M, lateral incisors. C, corner incisors. Cr, tushes. AM, wolf's teeth. MC, premolars. MP, molars. (*From Goubaux and Barrier.*)

The horse has two dentitions, namely, a milk or *deciduous dentition*, and a *permanent dentition*. Thus, the incisors and premolars which first appear, are milk teeth that are respectively

replaced, in due course, by permanent teeth. The molars are not preceded by milk teeth, and are consequently permanent. We frequently find in the mouths of foals, very small, pointed teeth, where the canines subsequently appear. Some authorities regard these minute teeth as rudimentary milk tushes; but they are so insignificant in size that we may, practically speaking, even while conceding this point, look upon the canines as permanent teeth.

The typical dental formula of the mammalia (animals which suckle their young) is (taking one side of each jaw):—

$$\text{incisors } \frac{3}{3} \quad \text{canines } \frac{1}{1} \quad \text{premolars } \frac{4}{4} \quad \text{molars } \frac{3}{3} = 44.$$

The teeth of the ancestors of the horse, from the *pliohippus* upwards, conformed to this arrangement; but the horse of the present day has, as a rule, only 3 premolars (2nd, 3rd, and 4th); although in embryo, as observed by Professor Cossart Ewart, the 1st premolar is always present. It is occasionally found in the upper jaw (Figs. 224 and 236), seldom in the lower jaw, and, as remarked by Goubaux and Barrier, very rarely in both jaws. These teeth, which are popularly called "wolf's teeth," are of comparatively small size and have only one root. Cornevin and Lesbre, who maintain that these teeth are always to be found in the upper jaw, state that they usually appear at the age of 5 or 6 months; that they generally fall out along with the second milk premolar, at about the age of $2\frac{1}{2}$ years; and are not replaced. They sometimes remain permanently in the jaw. They are vestigal, and not supernumerary teeth.

The two front incisors are termed *central incisors*; the next pair, *lateral incisors*; and the two farthest back, *corner incisors*. The premolars and molars are numbered respectively, 1, 2, 3, 4, and 1, 2, 3, from the front backwards.

Omitting the first premolar on account of its insignificant size and inconstant appearance, we may state that a horse with a "full mouth" has 40 permanent teeth, namely, 12 incisors (6 in each jaw), 4 canines, and 24 back teeth (6 premolars and 6 molars in each jaw); and that a mare with a "full mouth" has 36 teeth. Consequently, their respective permanent dental formulæ are:—

$$\text{i } \frac{3}{3} \quad \text{c } \frac{1}{1} \quad \text{pm } \frac{3}{3} \quad \text{m } \frac{3}{3} = 40, \text{ and i } \frac{3}{3} \quad \text{pm } \frac{3}{3} \quad \text{m } \frac{3}{3} = 36.$$

The milk dental formula of both horses and mares is:—

$$\text{i } \frac{3}{3} \quad \text{pm } \frac{3}{3} = 24.$$

The milk incisors differ from the permanent ones by being shorter and whiter; having a better defined neck; having their exterior surface smooth, while that of the others generally has a slight vertical groove; and from the fact that the milk incisors gradually become shorter and shorter, as soon as they come into wear, the opposite being the case with the permanent ones.

Form of the Teeth.

The form of the milk nippers is shown in Fig. 195. The permanent incisors (Fig. 196) taper gradually down to the end of the root, when viewed from the front, or from behind; although looking at them in profile, they are somewhat thicker away from the crown than on it. Hence, the table, which at first is broad from side to side, and narrow from front to rear, becomes in time, as it gets worn down, narrower and narrower from side to side, and slightly broader from front to rear. This is well shown by Fig. 197. Also compare Fig. 240 with Fig. 264.

Structure of the Teeth.

The teeth—like scarf-skin, hair and horn—are a special form of epithelium (pp. 154 and 190). "Hairs and teeth are organs in all respects homologous, and true dermal organs. . . . . Substitute corneous matter for calcareous, and the tooth would be a hair" (*Huxley*).

The body of a tooth (Fig. 198) is composed of an ivory-like substance called *dentine*, and has a hollow (the pulp-cavity) extending from its base up its centre, in which cavity the blood-vessels, nerves, and secreting cells, which are concerned in the nourishment of the tooth, are lodged. The dentine is more or less covered by a layer of white and very hard material termed *enamel*, with which the animal cuts and masticates his forage. In the milk incisors (Fig. 195), the enamel does not extend below the crown. In all the permanent teeth, the enamel also covers the greater part of the root. Over the whole surface of each unused tooth, there is an envelope of *cement*, which is nearly similar in structure to bone, and which can be regarded only as a covering, not as a portion, of the tooth, because its development is different from that of the dentine and enamel.* On the upper surface of

* "Cementum is, according to Messrs. Legros, Robin, and Magitot, developed, just as bone is, in two distinct methods.

"Where it is not to be very thick, and is to clothe roots, the ossification takes place in membrane (the alveolo-dentar periosteum), but where it is to form a

the incisors, the enamel forms a depression that is more or less filled with cement, which soon becomes discoloured by the food the animal eats. The hole thus made in the tooth is called the "mark." As this layer of cement varies from one-tenth to one-half of an inch in thickness, the "mark" wears out in the teeth of some horses, much quicker than it does in those of others. The outer enamel which surrounds the crowns of the teeth is, in the first instance, covered with a very thin layer of cement, which is soon rubbed off. After an incisor has been a short time in use, its table presents two more or less irregular rings of enamel (Fig. 199): the outer or external enamel, and the inner or central enamel. In the upper back teeth, the central enamel forms two "marks," which are circumscribed by an irregular ring of external enamel (Fig. 201). Although the enamel of the back teeth of the lower jaw does not form hollows on the tables of these teeth; "marks" are, however, made by the doubling in of the interior face of the enamel (Fig. 200).

The pulp-cavity in the incisors extends, at first, above the bottom of the "mark," and between this depression and the external enamel of the tooth (Fig. 198). After the tooth has made its appearance, the tooth-pulp commences and continues to secrete a new supply of dentine, which is of a yellow colour and is darker in hue than the original dentine. As soon as the tooth is somewhat worn down, the new dentine becomes exposed; the stain thus made on the cutting surface of the incisor, being called the *dental star.*

Changes Undergone by the Teeth with Age.

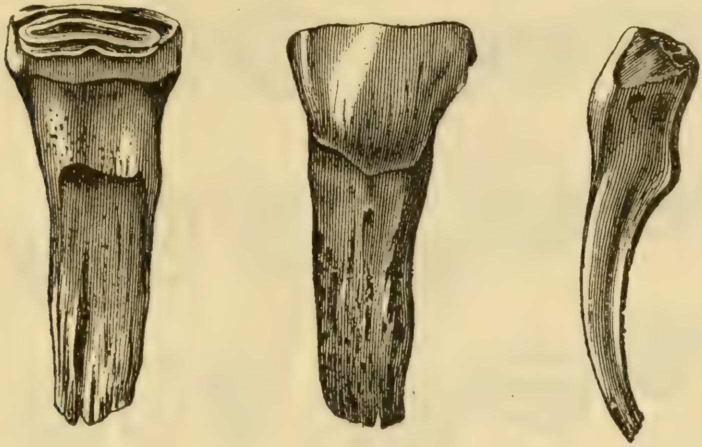
The chief changes are as follows:

1. Owing to the pulp-cavity being continually filled from behind by new dentine, the teeth are gradually, though slowly, forced out of their sockets. Our own teeth remain stationary in length, after they have attained their full size.

2. The milk-teeth become gradually worn down, and are replaced by permanent ones. The permanent incisors push out, from behind, the milk ones, the roots of which, being squeezed between the jaw and the new teeth, waste away; so that the milk-teeth, usually, readily drop out. They may, however, remain as a second

thick layer over the crown, as in Ruminants, a cartilaginous cement organ is formed, and we have a calcification analogous to formation of bone in cartilage. Thus the cement organ is found in those animals only which have coronal cement, such as the Herbivora" (*C. S. Tomes*).

row in front, and should, in this case, be removed by some suitable instrument.



A B C

Fig. 195.—A milk central incisor. A, rear view. B, front view. C, profile. (*From Goübaux and Barrier*).

3. The teeth show wear. The tables of the permanent incisors, as they become rubbed down, change their form in the manner

A B C

Fig. 196.—A permanent lower central incisor. A, front view. B, rear view. C, profile. (*From Goubaux and Barrier.*)

alluded to on p. 741, and as illustrated by Fig. 197 and by the plates giving the different ages. As a rule, the tushes become

shorter with age; although we sometimes find them very long, and even with their rearmost edge sharp, in old horses. I cannot

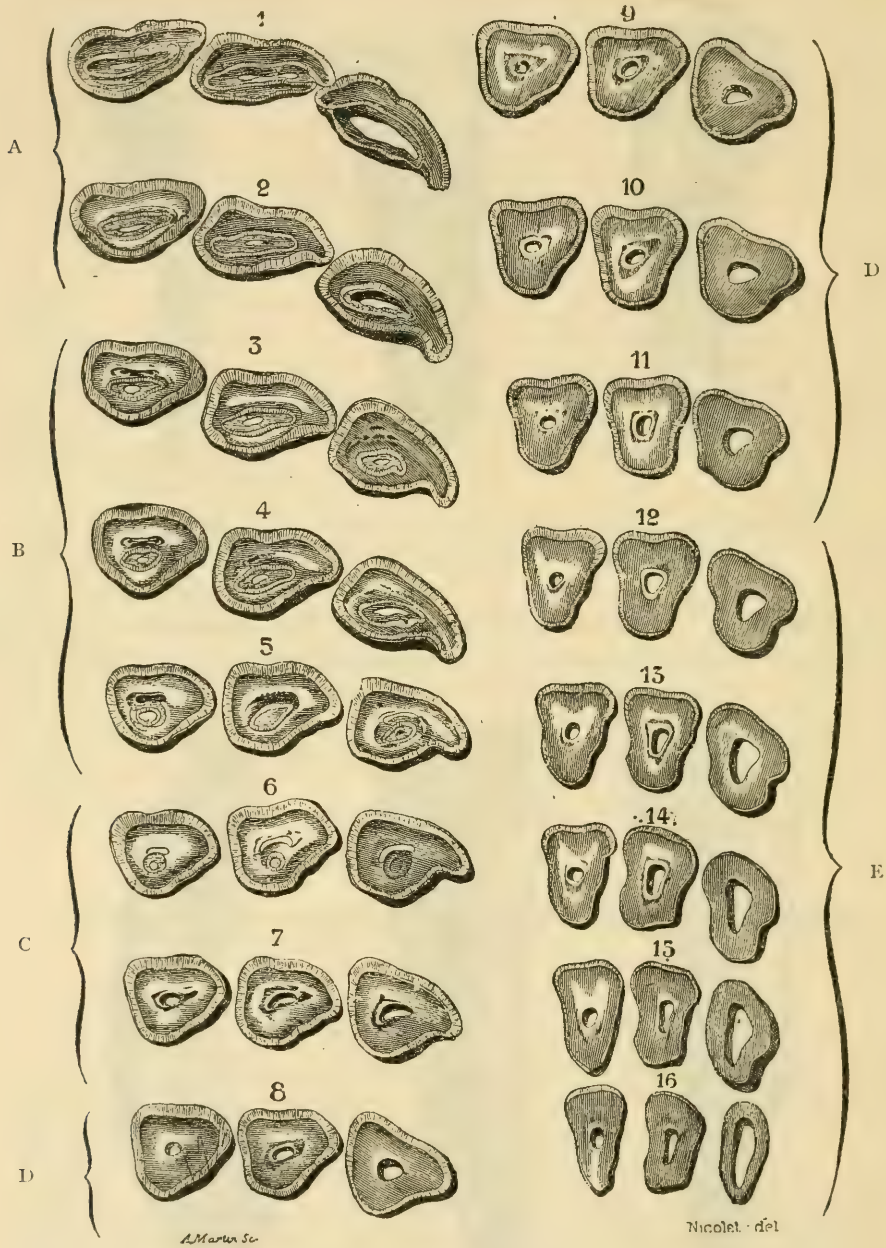


Fig. 197.—A series of transverse sections of the lower right incisors of a five-year-old horse.

A, narrow from front to rear. B, oval. C, rounded. D, triangular. E, elongated from front to rear. (*From Goubaux and Barrier.*)

satisfactorily explain how it is that these teeth usually wear down so fast; unless the friction of the tongue is the cause in question.

4. The permanent incisors grow more and more oblique, owing to their shape, and position in the jaws. Consequently, the angle

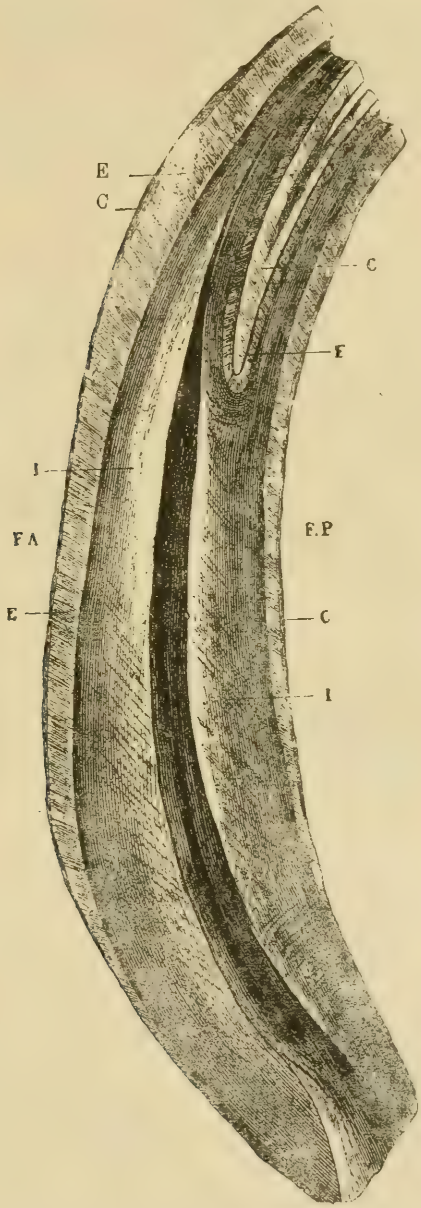


Fig. 198.—Longitudinal section from front to rear of a permanent central incisor of the lower jaw.
FA, anterior face. FP, posterior face. C, cement.
E, enamel. I, ivory or dentine. (*From Goubaux and Barrier.*)

formed by the respective teeth of both jaws, when the mouth is shut, becomes more and more acute with age. Their crowns

increase in length, on account of their wear not keeping pace with the rate at which the teeth are pushed out of their sockets.

5. The arch formed by the incisors in each jaw becomes, gradually, flatter and flatter. At first, when a horse has a "full mouth," the tables of the incisors are so broad from side to side, that the resulting arch is as round as practicable, in order to afford room for the teeth, which, then, more or less radiate outwards. As the teeth wear down, they obtain more and more room, on account

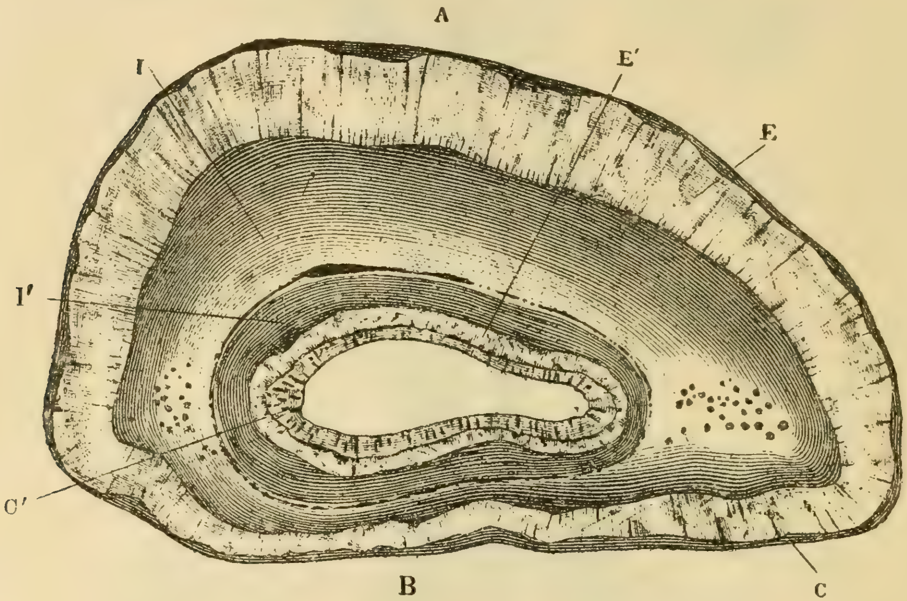


Fig. 199.—Transverse section of a lower right central incisor, showing the different layers of the tooth, with their relative thickness (enlarged). A, front face. B, rear face. C, external cement. C′, central cement. E, external enamel. E′, central enamel. I, external dentine. I′, internal and darker coloured dentine. (*From Goubaux and Barrier.*)

of their becoming narrower from side to side; and the jaw, consequently, "falls in."

6. Owing to the irritation set up, by the movement of the incisor teeth in their sockets, when they become short with age, the lining membrane (periosteum) of the sockets sometimes secretes, around the stumps, an excess of cement, which helps to keep these stumps in their place, and to increase the area of their cutting surface.

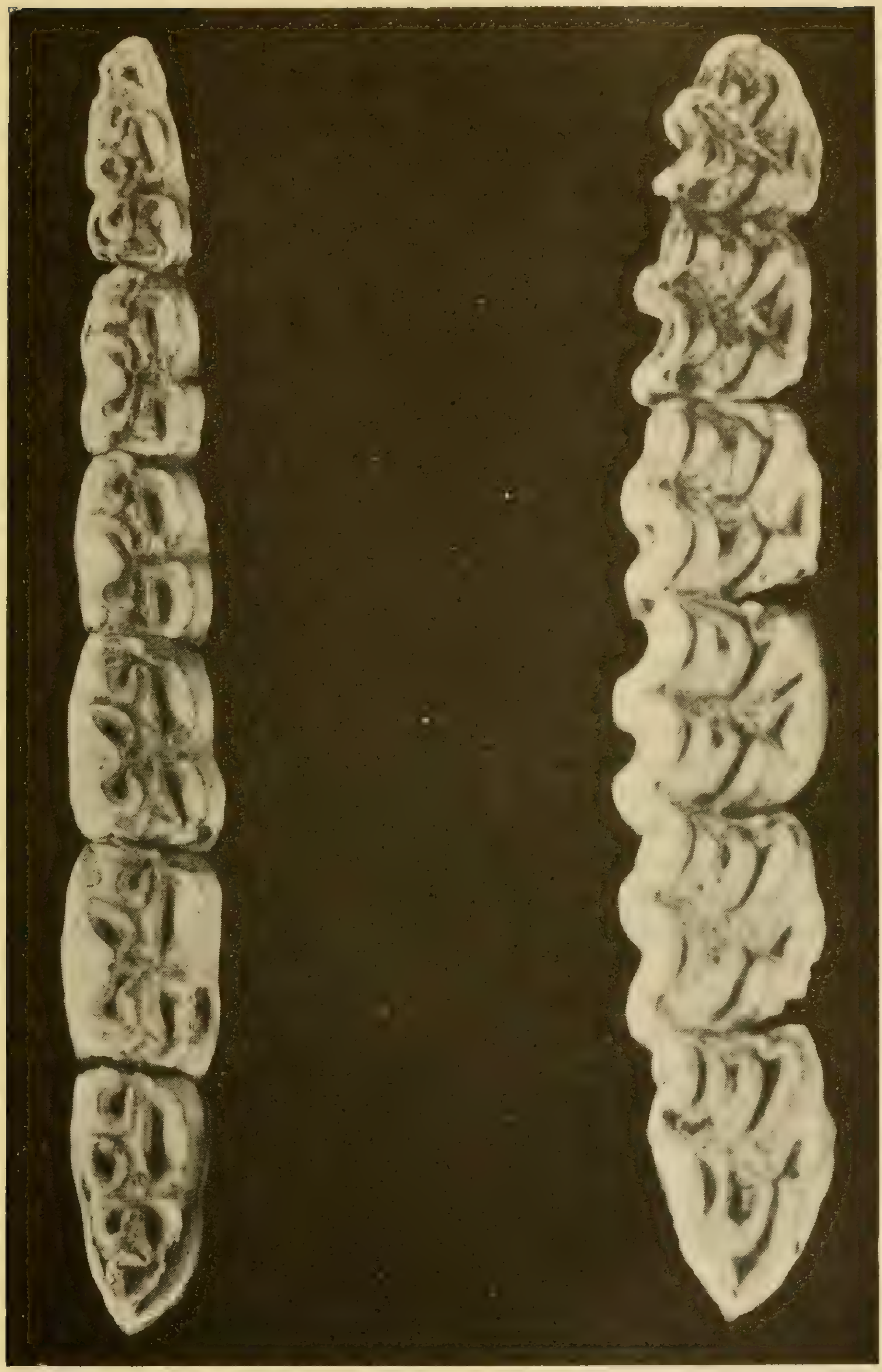


Fig. 200.—Back teeth of near side of lower jaw. Third molar is on top.

Fig. 201.—Back teeth of near side of upper jaw. Third molar is on top.

In taking this photograph the two jaws were placed side by side, with the teeth of the upper jaw pointing upwards.

Dates of Teething.

As a rule, the incisors of the upper jaw make their appearance sooner than those in the lower jaw. At birth, the central milk incisors show themselves under the gum (Fig. 215), and come through it about a week later on. The lateral milk incisors show through the gum at the age of about five weeks; and the corner milk incisors, when the animal is about nine months old. The eruption of the central, lateral, and corner permanent incisors respectively takes place at from $2\frac{1}{2}$ to 3, $3\frac{1}{2}$ to 4, and $4\frac{1}{2}$ to 5 years after birth (Cornevin and Lesbre).

Cornevin and Lesbre ("Traité de L'Age des Animaux Domestiques") state that the tushes very rarely come through the gum before the age of four years; that they are well in view at four and a half; and, at five years, are about the same length as the corner incisors. Solleysel has pointed out that the tushes of the lower jaw nearly always precede those of the upper jaw, by two or three months. M. Constant has observed that the tushes of the lower jaw appear at about the same time (51 to 52 months old) as the permanent corner incisors of the upper jaw; and those of the upper jaw, at about the same time (54 months old) as the permanent corner incisors of the lower jaw.

At, or shortly after, birth, the foal has twelve milk back teeth (premolars); namely, three on each side of each jaw. These teeth take up the position that are subsequently occupied by the 2nd, 3rd and 4th permanent premolars.

According to Cornevin and Lesbre, the dates of the eruption of the permanent premolars are as follows:—

2nd Premolar.		3rd Premolar.		4th Premolar.	
Upper.	Lower.	Upper.	Lower.	Upper.	Lower.
28 to 34 months.	26 to 32 months.	38 to 42 months.	30 to 34 months.	45 to 50 months.	40 to 44 months.

The 1st molar appears at from 10 to 12 months; the 2nd at about 2 years; and the 3rd, at about 4 years. As I have already stated, the molars are not preceded by milk teeth.

My experience is that the respective eruption of the lower molars precedes that of the upper molars, in a manner somewhat similar to that of the permanent premolars.

Causes which may Hasten or Retard the Appearance of the Permanent Teeth.

It is generally considered, that thoroughbred horses and those which are fed from an early age on "hard food," shed their milk-teeth sooner than under-bred animals and those that are brought up on green fodder. Toussaint, Goubaux and Barrier are of opinion that neither breed nor food has any influence in this respect. If this be the case, horses differ therein from horned cattle; for a two-year-old Shorthorn which has been highly fed, shows as a rule, the same "mouth" as an ordinary ox of two-and-a-half years. As the chief function of the incisor teeth is the prehension and division of food that offers a certain amount of resistance to its removal from the place it occupies, or to its entrance into the mouth, it is reasonable to conclude that horses which have to graze on grass of a dry nature, or to consume forage that requires a good deal of cutting, will wear out their incisors, especially, their front and middle ones, quicker than animals that are fed, principally, on corn and "chop," which demand but little aid from the incisor teeth for their prehension and division. This conforms to what I have been told concerning the rapid wear of the incisors of horses which are fed, in some districts of America, on sugar-cane as a part of their fodder. Bizard and Traeger have remarked that the fact of mares which have milk-teeth, being in foal, considerably (say, for a year or more) delays the fall of these teeth and the appearance of the permanent ones. I have seen the same thing occur in cases of osteoporosis (p. 262).

The fraudulent practice of extracting certain of the milk incisors, in order to hasten the appearance of the permanent ones, may be successful in its object to an extent of two or three months, at the farthest. It appears, that if the operation be performed too long, say, more than six months, before the usual fall of the temporary teeth, the result is not "advanced" in any way; for the resulting wound soon closes up, and leaves a hard scar. To be effectual, it should not be done more than three months before the natural fall of the teeth. In England, we frequently see that it has been performed on four-and-a-half-year-old mouths, in order to make them resemble those of five-year-old animals. The fraud is easily recognised from the fact that the central or lateral permanent incisors, as the case may be, do not show wear commensurate with the absence of the milk-teeth which have been removed. Also, the extent of the eruption of the replacing teeth is, often, not sufficient to account for the fall of the milk-teeth which preceded them.

Many copers, being ignorant that, as a great rule, the upper milk incisors fall out earlier than the lower ones, remove the latter only, and thus perpetrate a transparent fraud. English dealers often call these animals " Yorkshire five-year-olds."

Dates from which Horses are Aged.

In England, thoroughbreds take their age from 1st January. Thus, an animal of Stud-Book parentage, dropped any time, say, in the year 1903, would remain a foal till the 31st December, 1903; would be a yearling on the following day, and would remain so up to the 31st December, 1904, and he would be a two-year-old from the 1st January to the 31st December, 1905. Half-bred horses take their ages, in England, usually from the 1st May. In Australia, Tasmania, New Zealand, and South Africa, horses are aged from the 1st August. For instance, a Colonial colt born in September, 1902, or in March, 1903, will be a two-year-old on the 1st August, 1904. If we want to age a young horse, the actual date of whose birth is unknown to us, we should, in case of doubt, assign to him the younger of the two ages, if his " class birthday " be near at hand; the older of the two, if it be recently past. Thus, suppose an Australian horse had a " full mouth " (all his incisors permanent) in June, but his corner incisors showed little or no wear, he should be then aged as a four-year-old, and, two months later, would become a five-year-old. At the worst, we could, here, be only a couple of months out. But if we put him down as five, we should be adding on, at least, nine or ten months to his age. If a Colonial animal in, say, September showed the condition of mouth just described, we should age him as five years old; for if we put him down as four, we should be giving our sanction to an animal at least four years and nine months, remaining a four-year-old for another eleven months! In India, Arabs and country breds are aged from the 1st January. Here, again, if we had to age in, say, September, an Arab which had shed only his central milk incisors, it would be right to age him as a three-year-old, if there was a doubt as to his retaining his lateral milk incisors until the 1st of the following January.

The term, " rising," is, as a rule, applied to a horse's age, when it is less than that which is stated; and, " off," when it is more. The former is used when the birthday is comparatively near at hand; the latter, when it has recently past. Thus, a horse " rising five " is a four-year-old which is nearer five than four. An animal " four off," is a four-year-old that is nearer four, than five.

The large majority of half-bred horses which are sold as five-year-olds during the autumn in England and Ireland, as I have

already indicated, are really only four-year-olds. Such animals, instead of having the cutting surfaces of the corner incisors of both jaws fully in wear, on the inside as well as on the outside of the tooth, very rarely show any wear of the upper corner incisors at the time mentioned.

Teeth which Retain the Mark and Central Enamel Beyond the Ordinary Time.

The depth of the cavity on the tables of the incisor teeth varies considerably in different horses, and even in particular pairs of teeth, in the same mouth. The thickness of the layer of cement lining these cavities, is also, as we have seen on p. 742, subject to much variation. Hence, it is not at all uncommon to meet with mouths, the "marks" in which indicate that the animal is "younger" than he really is; that he is "younger" on one side of his mouth than on the other; or that one or more teeth retain these cavities to an unusually late period. The varying hardness of the teeth and of the forage, naturally contribute to irregularity in the amount of wear. In less frequent cases, the marks disappear earlier than usual. It is not a very rare occurrence to observe that the mark has disappeared out of the lateral lower incisors in a six-year-old animal. These considerations render the "mark," of itself, anything but a safe guide to the determination of a horse's age. The roundness of the tables of the lower central incisors, and, to a less degree, of the lateral ones; the oval appearance of the tables of the corner incisors; the shortness and central position of the dental star; the smallness of the central enamel of the lower central teeth, and its closeness to the posterior edge of the table; the obliquity of the teeth, as viewed in profile; and the flatness of the curves of the incisor teeth will afford unerring proofs that the animal ought to be "beyond mark of mouth," namely, over eight years.

Retention, for an unduly long period, of the apex of the cone of the central enamel of the permanent incisors, gives a false appearance of comparative youth to the mouths of some horses. This, of course, occurs only after the cavity (or "mark") has disappeared; and is due to the fact of the solid apex of the cone of enamel being deeper than usual; to the hardness of the teeth themselves; or, to some extent, to the soft nature of the food. The form and degree of obliquity of the incisors, and the position and extent of the dental star, will serve as guides from which to draw correct deductions as to the age.

Irregularity in the Respective Size of the Upper and Lower Jaw.

The chief irregularity under this heading, is that of parrot-mouth," in which the teeth of the upper jaw project, to a considerable extent, beyond those of the lower jaw (Figs. 202, 203, and 204). Although parrot-mouth in a fully developed form, appears as a rule only in old horses; we may commonly see, even in five and six year olds, the upper central incisors projecting a little beyond the lower ones. This tendency is slightly shown in Fig. 242; and in a well-marked manner in Fig. 256. It is almost certain that animals possessing this peculiarity would become parrot-mouthed in their old age. Surgical interference is generally required in well-developed cases of parrot-mouth; because this condition greatly diminishes the animal's power of seizing and cutting his food with his front teeth.

It is not a very rare occurrence to find the lower jaw slightly in advance of the upper one, which is a peculiarity that renders an animal "under-hung." I have seen this condition in a horse, and also in a mule, existing to such an extent that the lower front incisors almost completely hid from view the upper front incisors. The posterior aspect of the former was a good deal worn away by friction with the anterior face of the latter.

Irregularities in the Teeth.

We sometimes find one or more supernumerary permanent incisor teeth (Figs. 205, 206, 207, and 208), especially in the upper jaw. These teeth form a more or less complete row behind the ordinary incisors. They are entirely different from the stumps of milk teeth which are sometimes retained (Fig. 209); are inserted more or less firmly in the jaw; and interfere to a greater or less degree with the regularity of the respective positions taken up in the jaw by the ordinary incisors.

In rare cases, the incisors assume irregular forms even in young mouths.

The presence of a supernumerary molar is very rare in a horse. Fig. 210 shows this peculiarity on the near side of the lower jaw of a ten-year-old animal. As it could not be a case of atavism (reversion to a more or less remote ancestor), it was probably one of dichotomy (splitting into two parts).

The irregularities due to crib-biting have been alluded to on page 556.

Bishoping

is a fraudulent operation, which consists in giving a false appearance of youth to the incisors of an old horse (Fig. 211) by shortening the length of two or more of them and making cavities in them to resemble "marks." The trick can be easily seen by the absence of enamel round the false "marks"; by the spaces between the upper and lower incisors, when the jaws are brought together (Fig. 212); by the shape of the tables; by the shape of the teeth; by the narrowness of the neck of the teeth; and by the marks of the file.

Fig. 202.—Side view of parrot-mouth (nat. size).

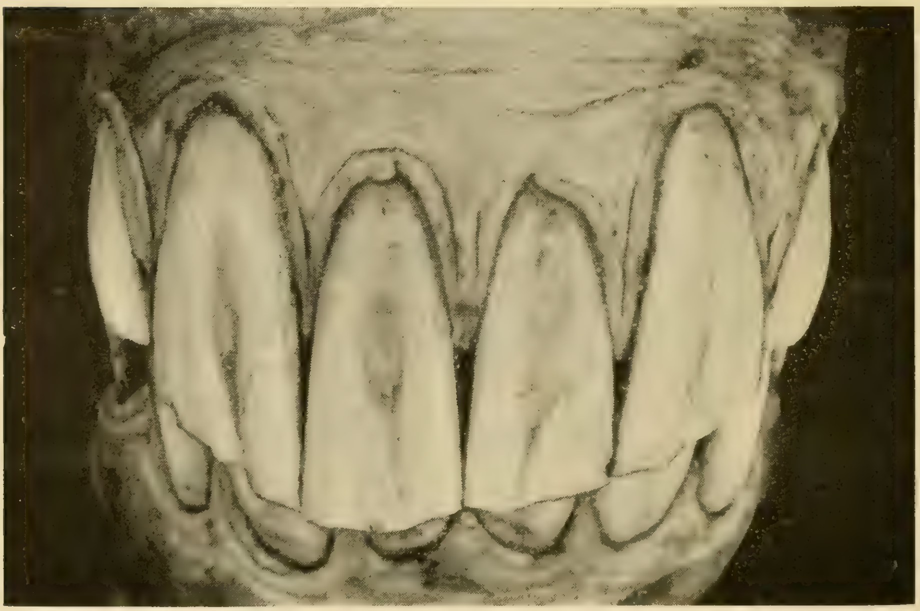


Fig. 203.—Front view of parrot-mouth nat. size).

Fig. 204.—Tables of parrot-mouth shown in Figs. 202 and 203 (nat. size).

Fig. 205.—Side view of mouth with ten incisors in upper jaw (nat. size)

Fig. 206.—Front view of mouth shown in Fig. 205 (nat. size).

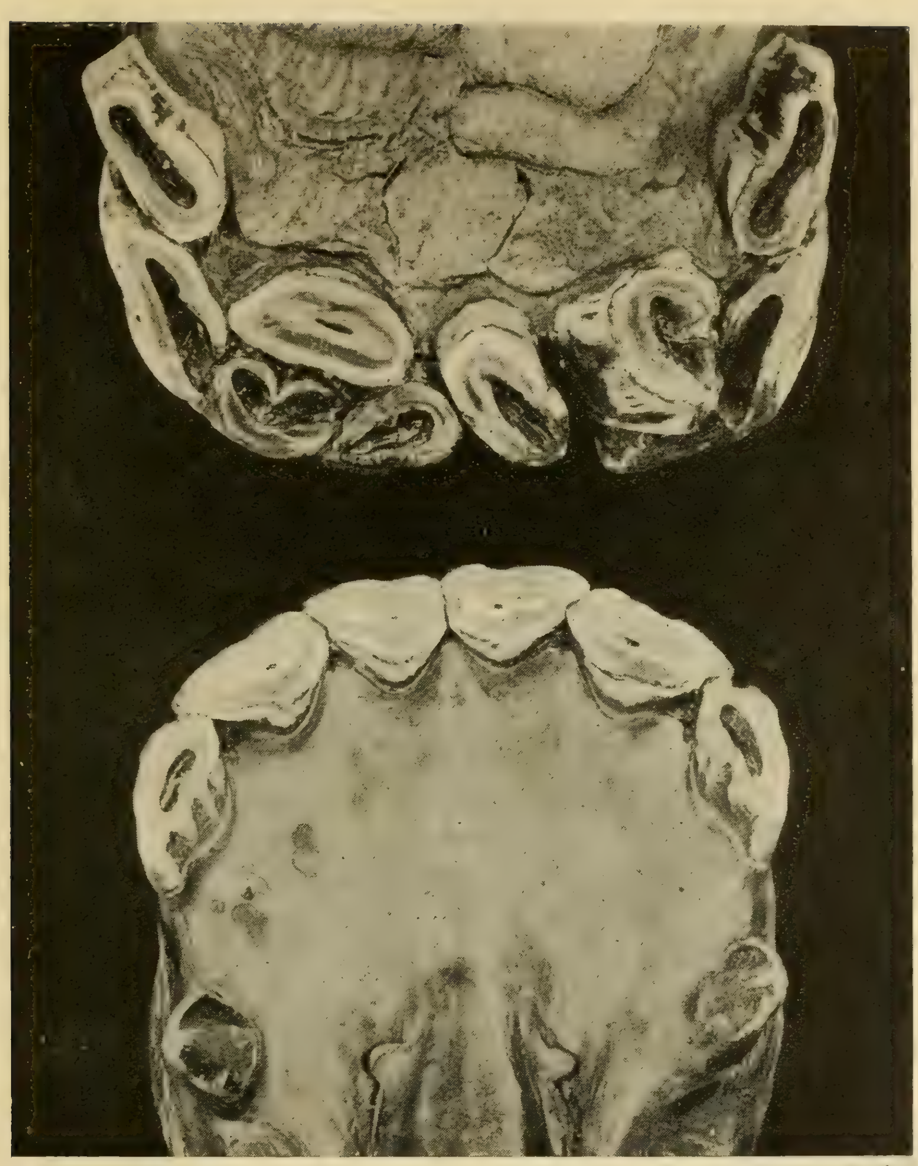


Fig. 207.—Tables of incisors of mouth shown in Figs. 205 and 206 (nat. size)

Fig. 208.—Mouth of seven-year-old horse with seven incisors in upper jaw (nat. size).

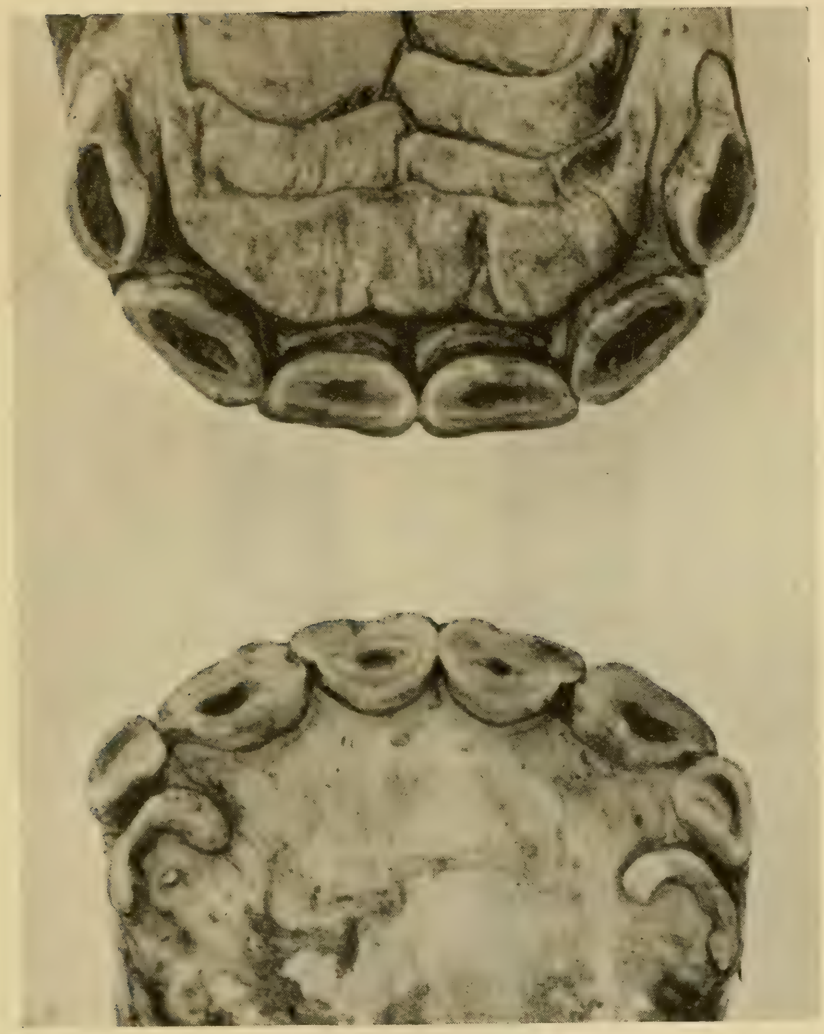


Fig. 209.—Stumps of corner milk incisors retained in lower jaw of horse rising five (nat. size).

Fig. 210.—Lower jaw of horse with four molars on near side ($\frac{2}{3}$ nat. size).

Fig. 211.—Mouth bishoped to make a fourteen-year-old horse appear to be a six-year-old (nat. size).

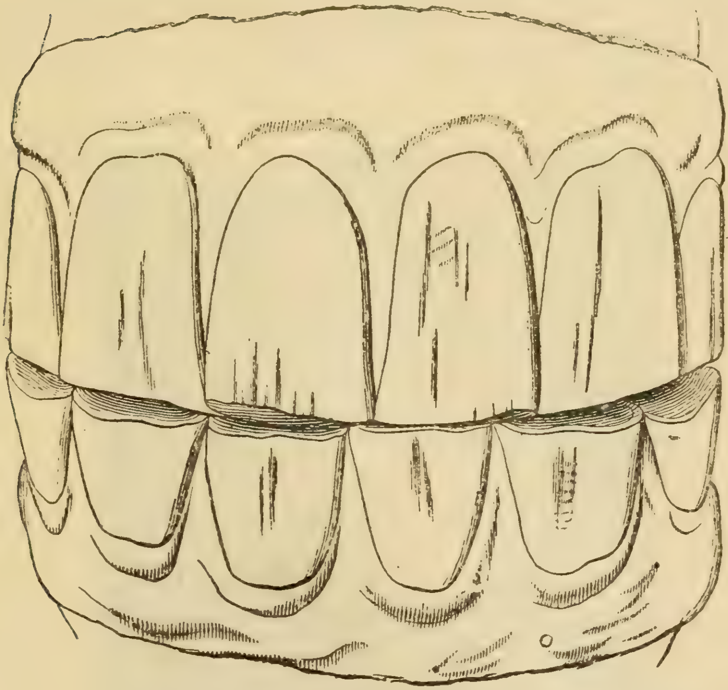


Fig. 212.—Bishoped mouth, showing spaces between the incisors of the two jaws. (*From Goubaux and Barrier.*)

ILLUSTRATIONS OF DIFFERENT AGES.

MOUTH AT BIRTH—MOUTH AT SIX MONTHS—MOUTH AT ONE YEAR—MOUTH AT TWO YEARS—MOUTH AT THREE OFF—MOUTH AT FOUR YEARS—MOUTH AT FIVE YEARS—MOUTH AT SIX YEARS—MOUTH AT SEVEN YEARS—MOUTH AT EIGHT YEARS—MOUTH AT NINE YEARS—MOUTH AT TEN YEARS—MOUTH AT FOURTEEN YEARS—MOUTH AT TWENTY-ONE YEARS—MOUTH AT THIRTY YEARS—MOUTH AT FORTY-TWO YEARS.

All of the following illustrations are reproductions of photographs which I took of the mouths of horses of carefully authenticated ages. Only one horse's mouth was used in each series, as for instance, in Figs. 213 to 216, Figs. 217 to 220, etc.

Fig. 213 —Side view of incisors (nat. size).

Fig. 214.—Front view of incisors (nat. size).

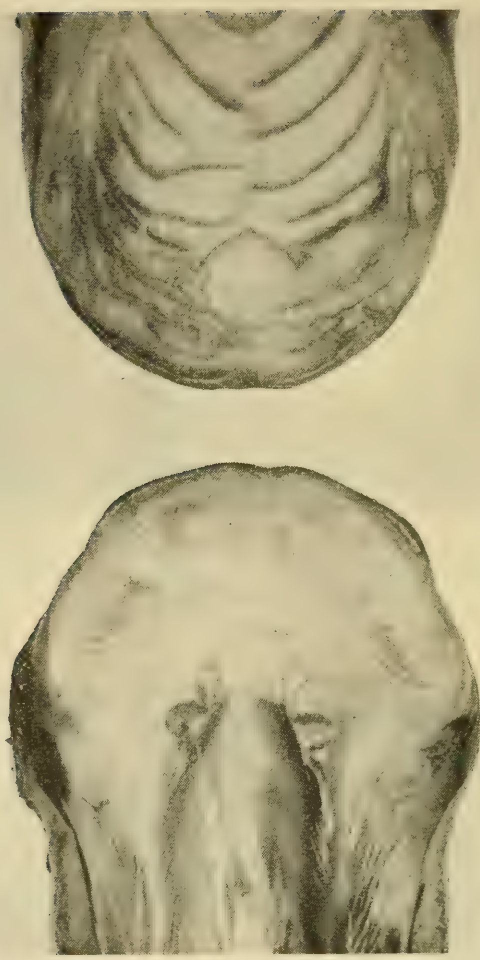


Fig. 215. – Tables of incisors (nat. size).

The central milk incisors can be clearly seen under the mucous membrane; the lateral ones, less plainly.

Fig. 216.—Tables of teeth of both jaws (½ nat. size).

The three milk premolars show themselves through their covering mucous membrane, but have not yet penetrated it.

Fig. 217.—Side view of incisors (nat. size).

Fig. 218.—Front view of incisors (nat. size).

Fig. 219.—Tables of incisors (nat. size).

When the mouth is closed, the central incisors of both jaws are fully in contact, and the lateral incisors are partly in contact. The corner incisors of the upper jaw have made their appearance, but those of the lower have not yet penetrated the mucous membrane which covers them, although they can be felt underneath it.

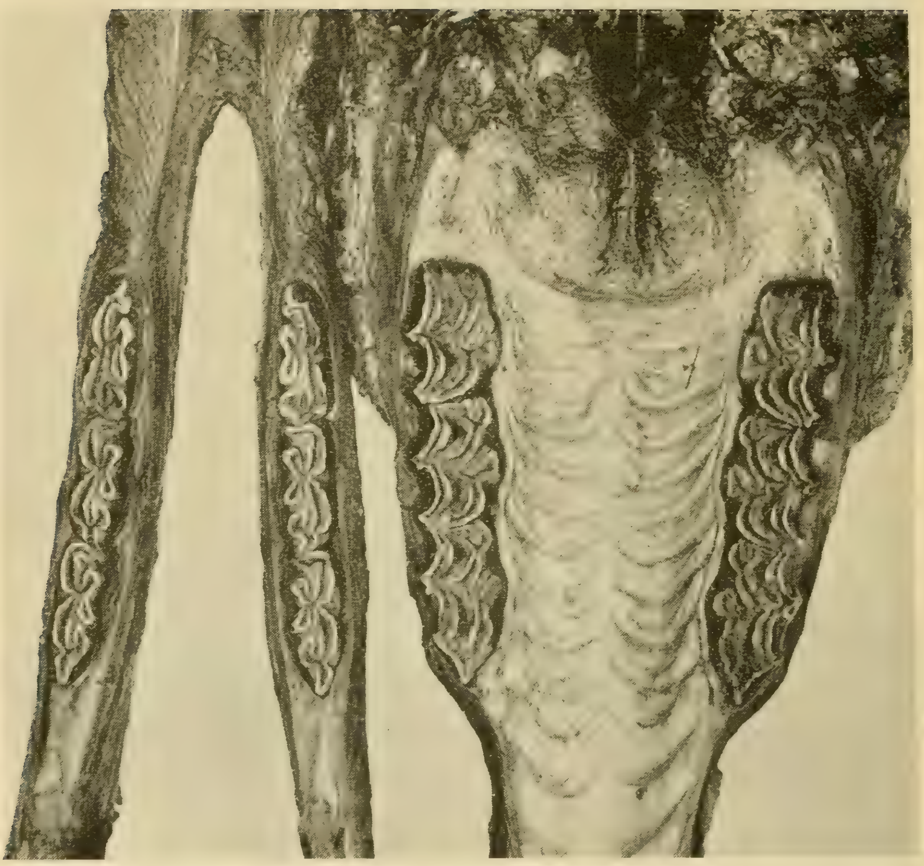


Fig. 220.—Tables of back teeth ($\frac{1}{2}$ nat. size).

The three milk premolars are now fully developed. In this illustration, the 2nd premolars of the lower jaw are placed in a line with the 4th premolars of the upper jaw; and *vice versâ*.

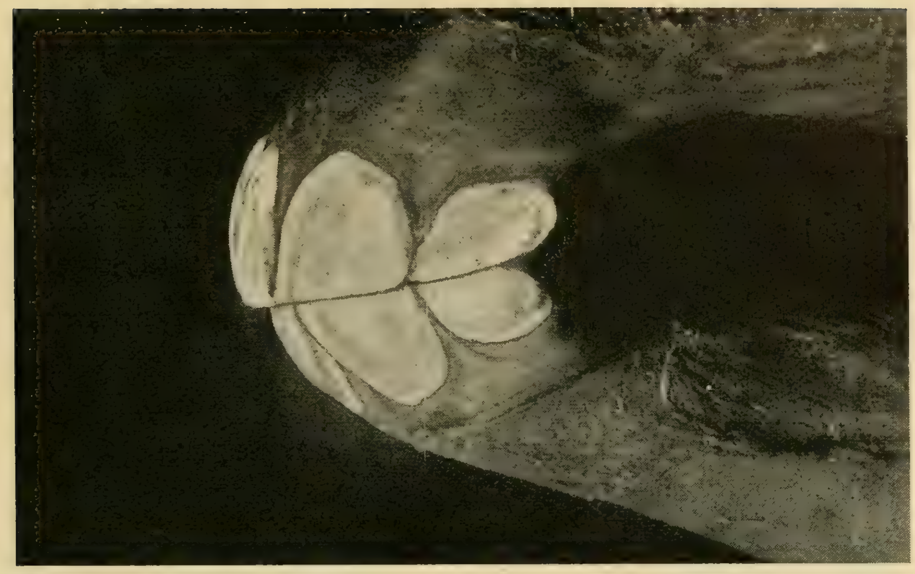


Fig. 221.—Side view of incisors (nat. size).

Fig. 222.—Front view of incisors (nat. size).

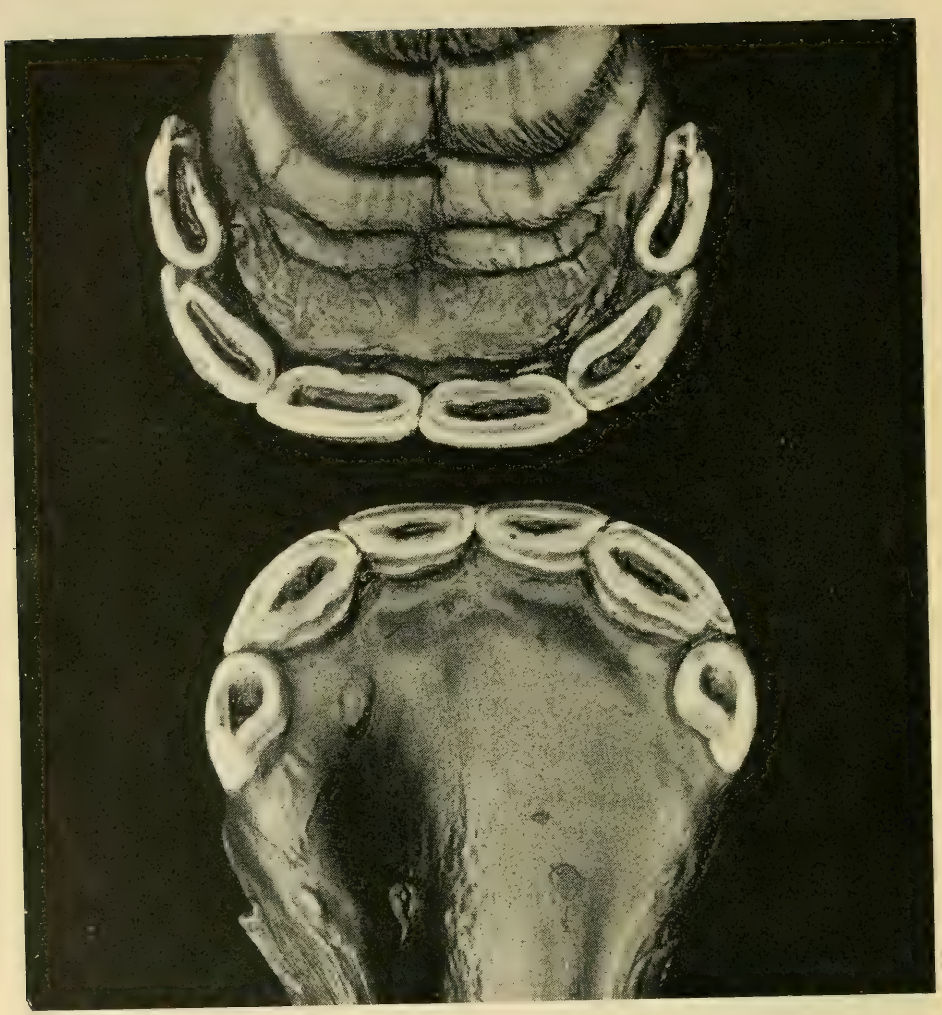


Fig. 223.—Tables of incisors (nat. size).

As a rule, the corner incisors, at this age, are not in contact, as they are in this case. The "mark" is present in all the teeth.

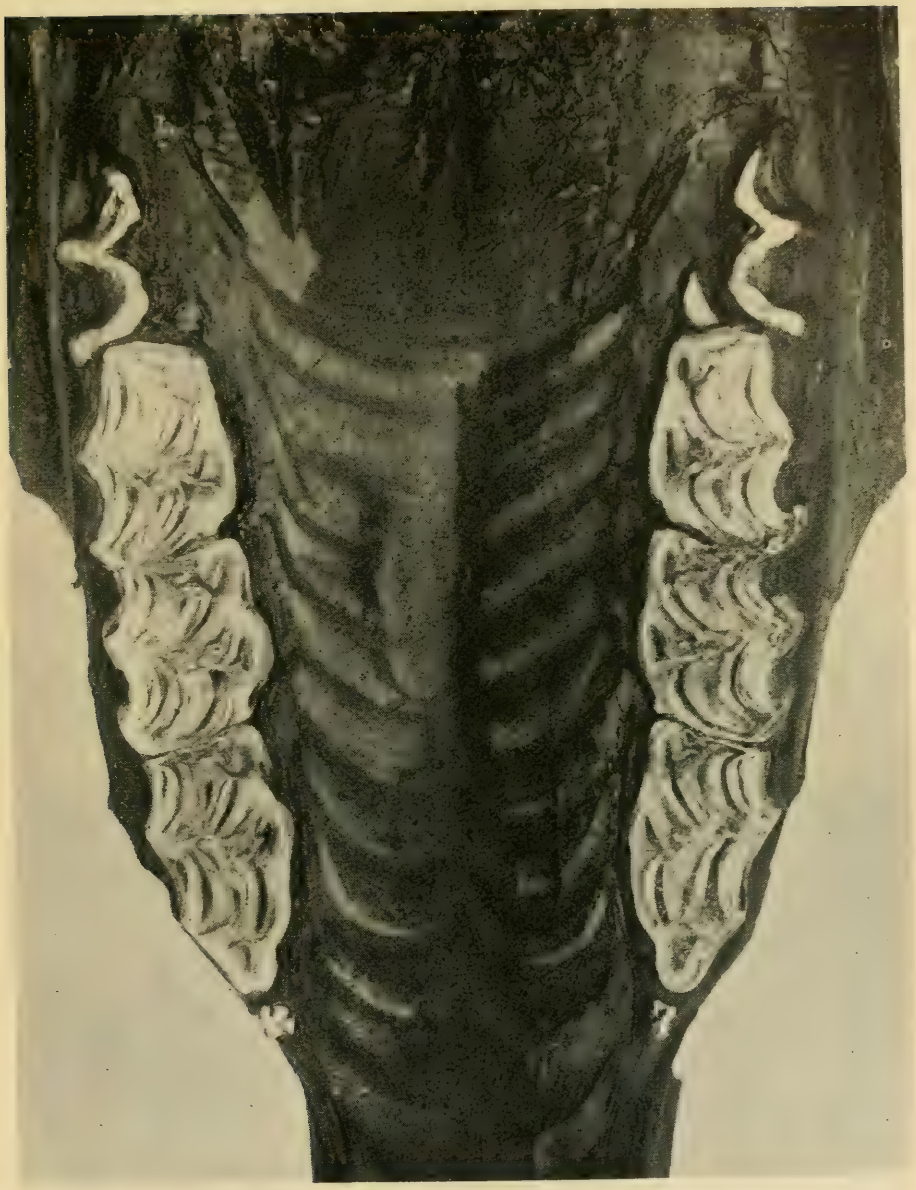


Fig. 224.—Tables of back teeth of upper jaw ($\frac{2}{3}$ nat. size).

The first molar has just appeared through the gum. The first premolars (wolf's teeth) are also present.

Fig. 225.—Tables of back teeth of lower jaw ($\frac{2}{3}$ nat. size).

The first molar has evidently made its appearance about a month earlier than the first molar of the upper jaw.

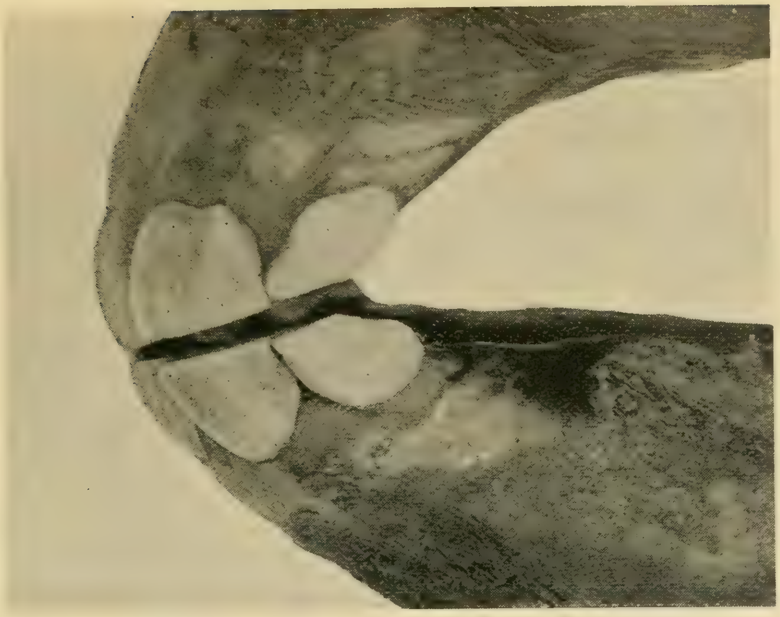


Fig. 226.—Side view of incisors (nat. size).

Fig. 227.—Front view of incisors (nat. size).

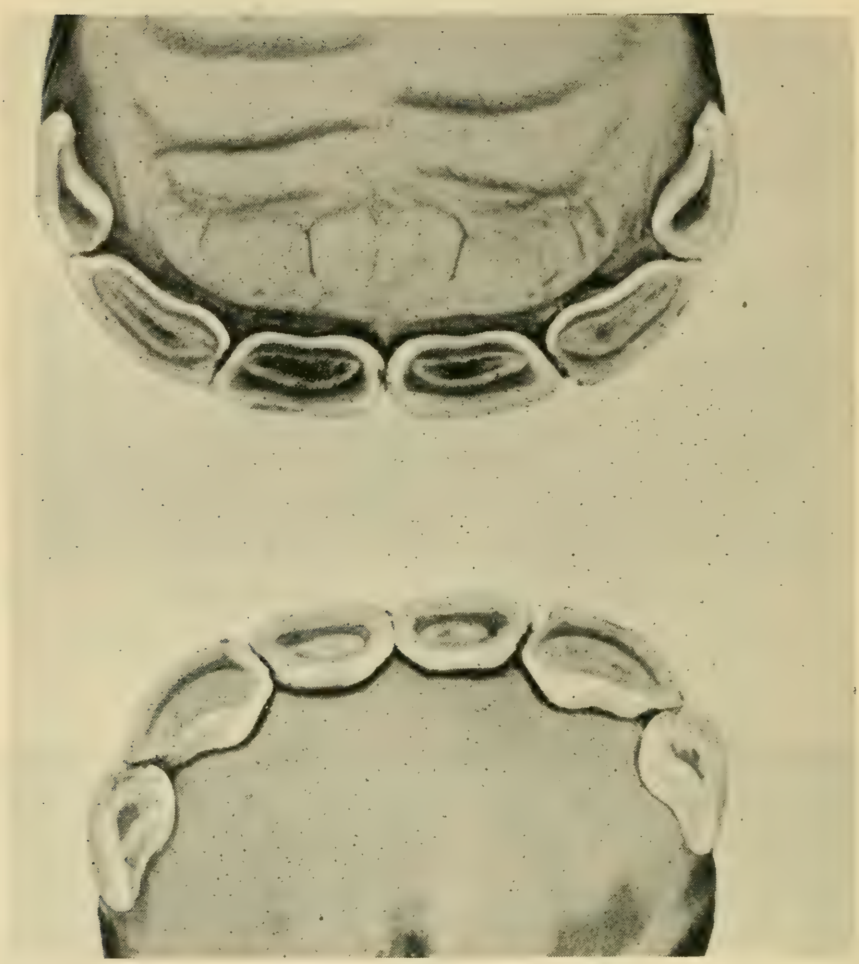


Fig. 228.—Tables of incisors (nat. size).

The curves made by the incisor teeth are much flatter than those made by the incisor teeth in Fig. 223 (mouth at one year), and consequently the corner incisors are in view, when the mouth is looked at from the front (Fig. 227). The "marks" have nearly disappeared out of all the incisor teeth of the lower jaw.

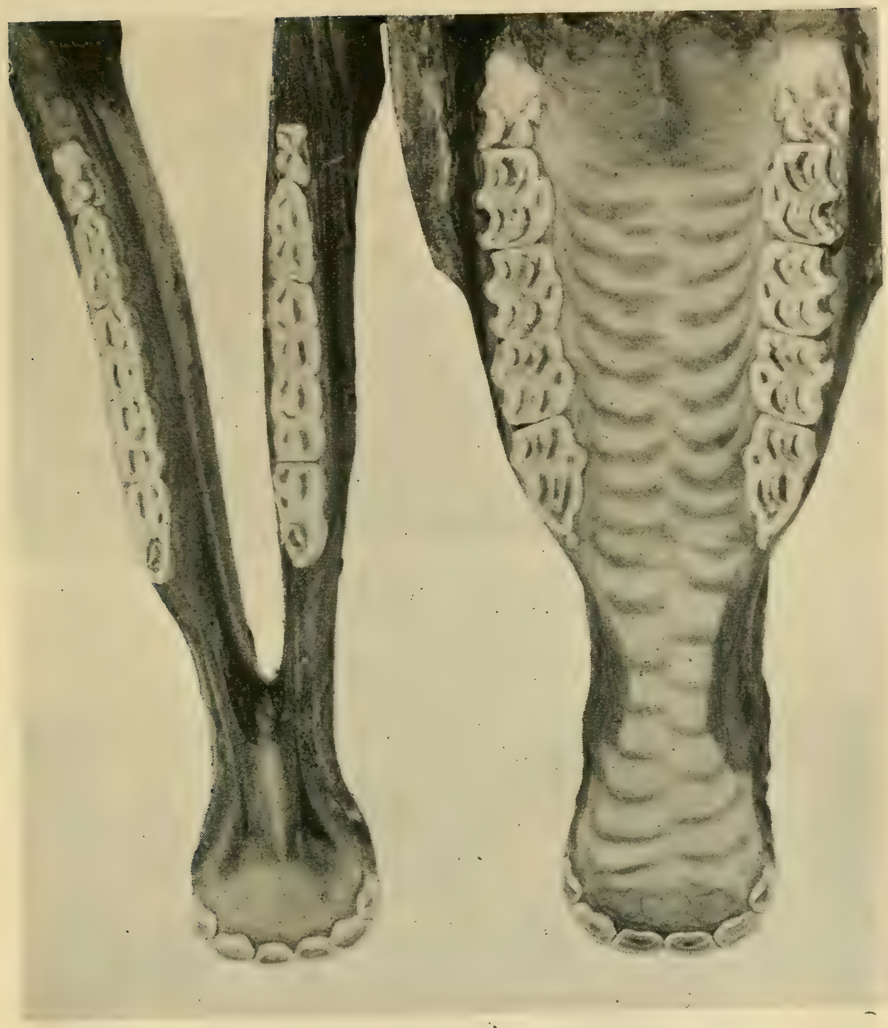


Fig. 229.—Tables of the teeth of both jaws ($\frac{1}{3}$ nat. size).

The eruption of the second molars is now taking place.

Fig. 230.—Side view of incisors (nat. size).

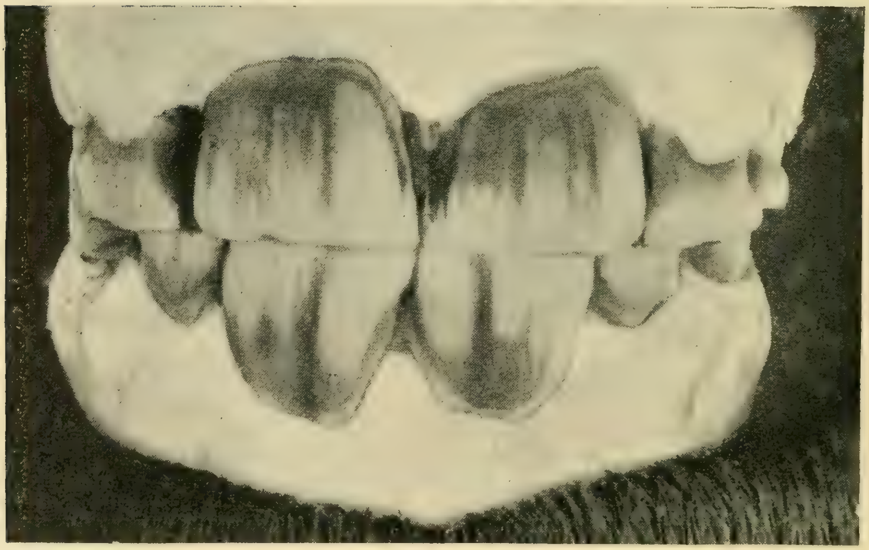


Fig. 231.—Front view of incisors (nat. size).

Fig. 232.—Tables of incisors (nat. size).

The central milk incisors were shed when the animal was rising three, and the central permanent incisors did not come in contact with each other (when the mouth was closed), until three years, or a little after. The hold on the gum of the lateral milk incisors is much loosened.

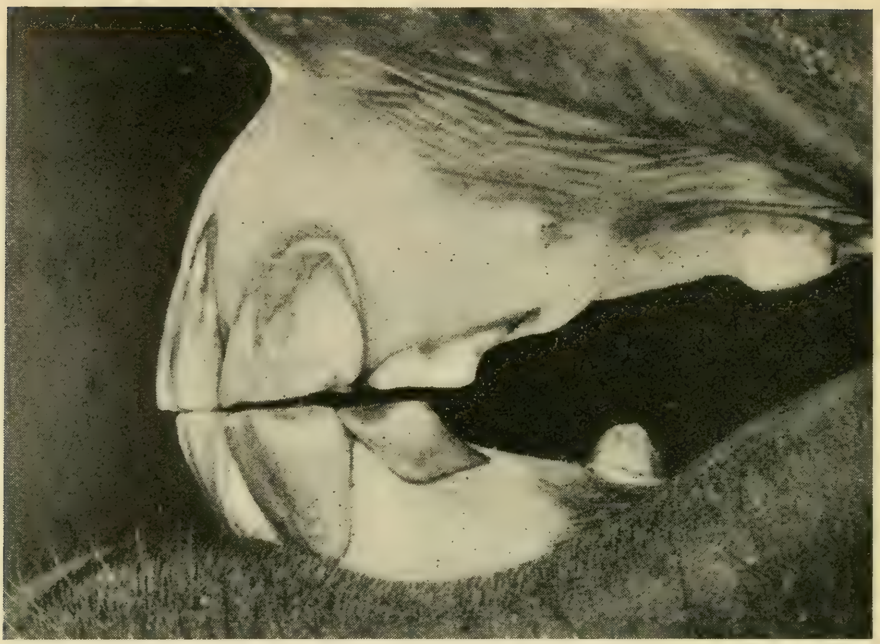


Fig. 233.—Side view of incisors (nat. size).

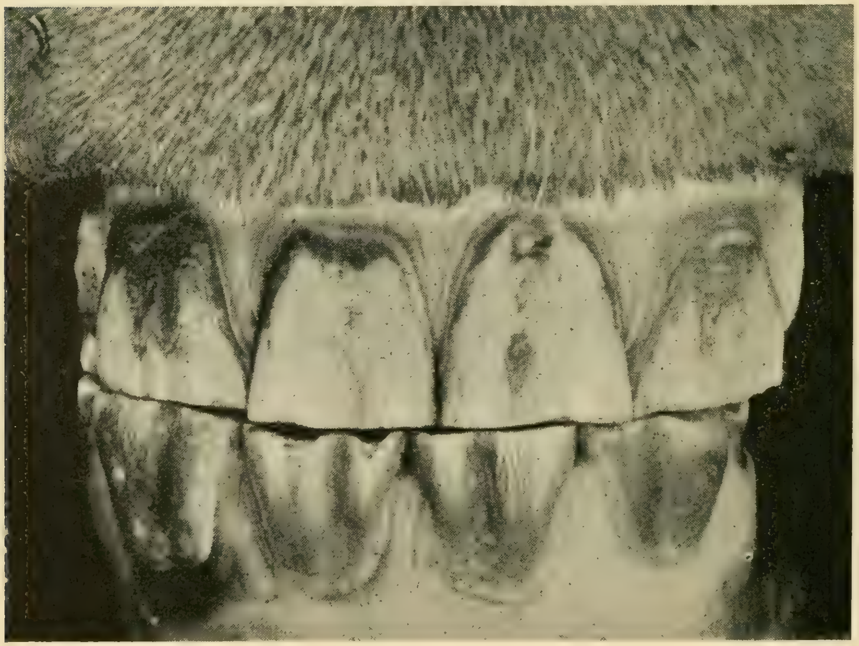


Fig. 234.—Front view of incisors (nat. size).

Fig. 235.—Tables of incisors (nat. size).

When rising four, the lateral milk incisors fall out and become replaced by permanent ones, which do not become level with the central incisors until the horse is four or nearly four years old. At four years of age, the corner milk incisors are well worn down, the upper ones being ready to be pushed out. The tushes, as a rule, begin to show through the gum about this time.

Fig. 236.—Tables of back teeth of upper jaw ($\frac{2}{3}$ nat. size).

The 1st premolar is present. The 4th permanent premolar has come through, and the 3rd molar is just appearing.

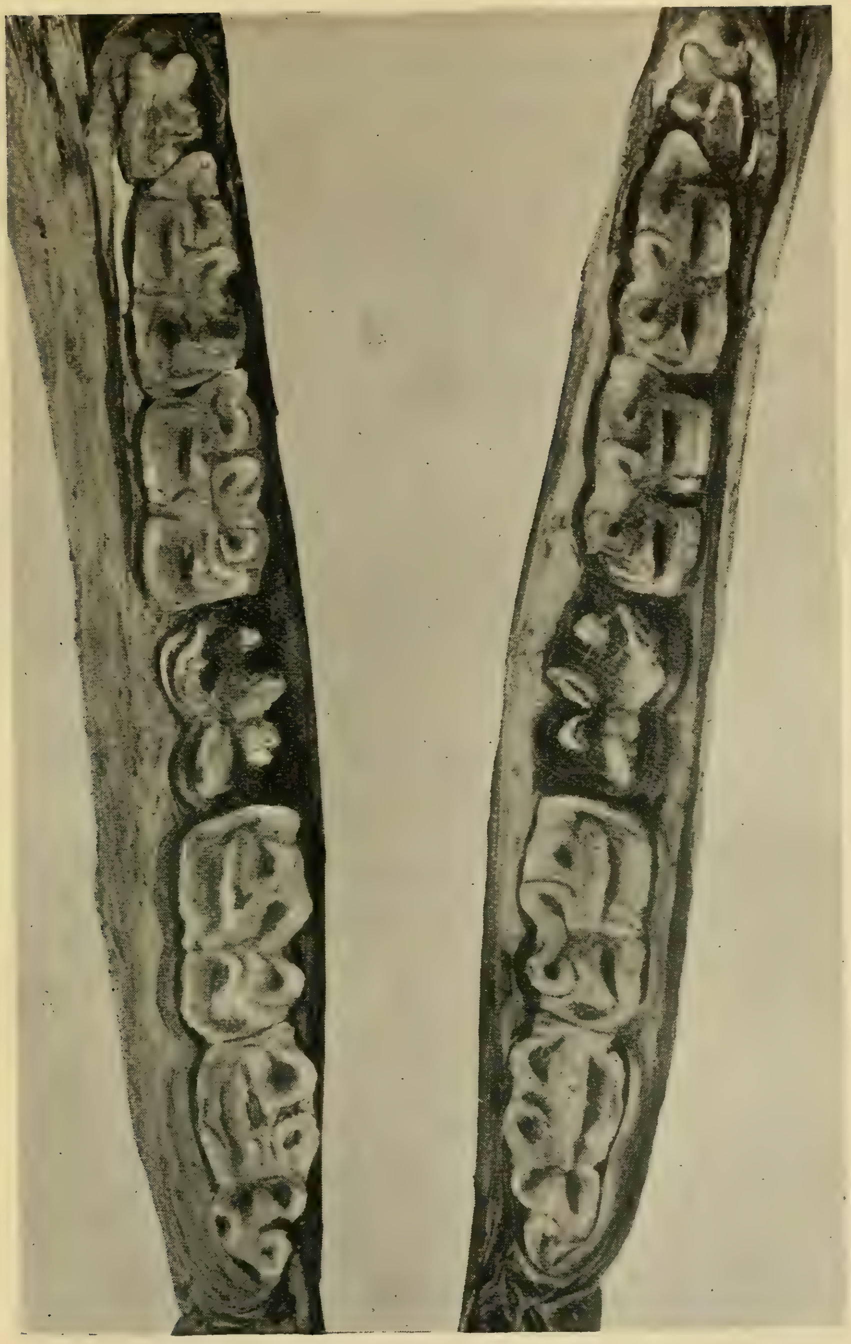


Fig. 237.—Tables of back teeth of lower jaw ($\frac{2}{3}$ nat. size).

The 4th permanent premolar and 3rd molar are making their appearance.

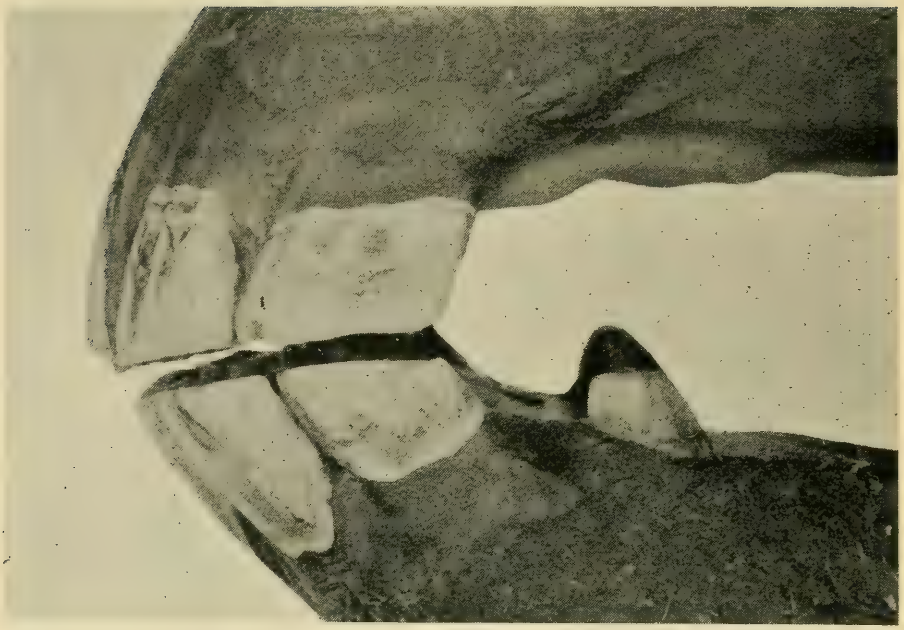


Fig. 238.—Side view of incisors (nat. size).

Fig. 239.—Front view of incisors (nat. size).

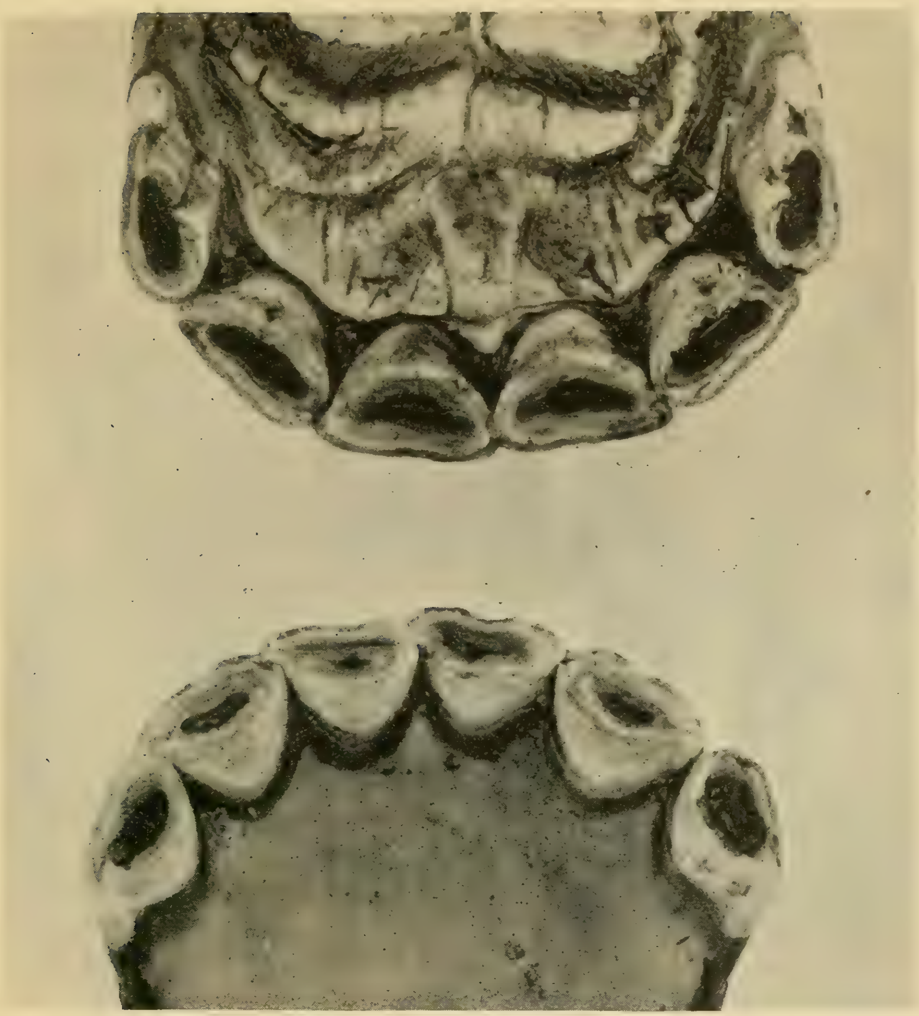


Fig. 240.—Tables of incisors (nat. size).

About six months previously, the corner milk incisors fell out. All the incisors are now on a level with each other; although the inner edges of the corner ones have not yet come into use. The width of the neck of the upper corner incisor (viewed sideways, Fig. 238) is about equal to that of the table of the tooth, the outside aspect of which is, consequently, more or less in the form of a parallelogram. The tushes are well developed, and the horse has a "full mouth."

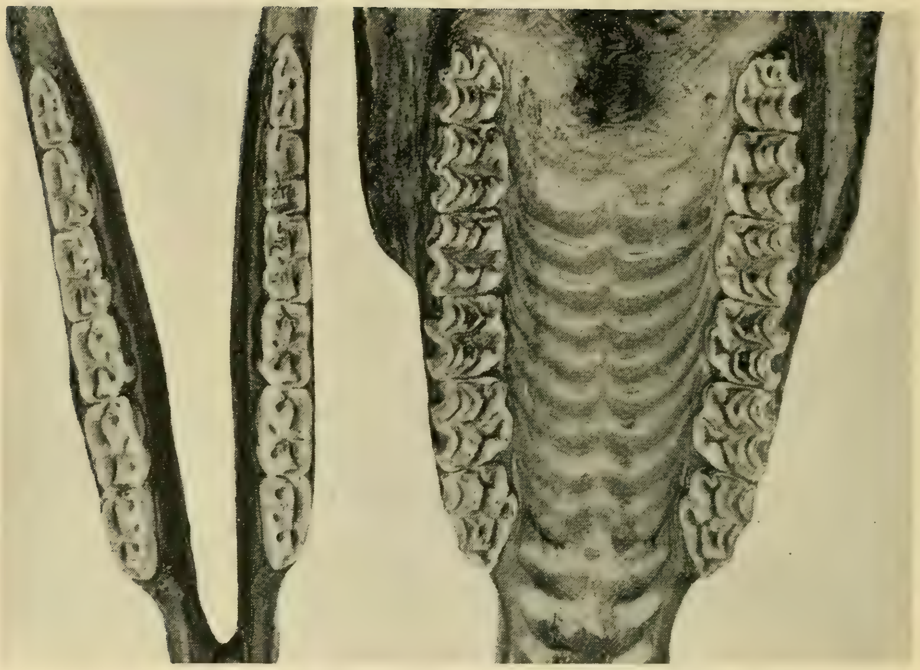


Fig. 241.—Tables of back teeth ($\frac{1}{3}$ nat. size).

The permanent premolars and molars are now complete.

Fig. 242.—Side view of incisors (nat. size).

Fig. 243.—Front view of incisors (nat. size).

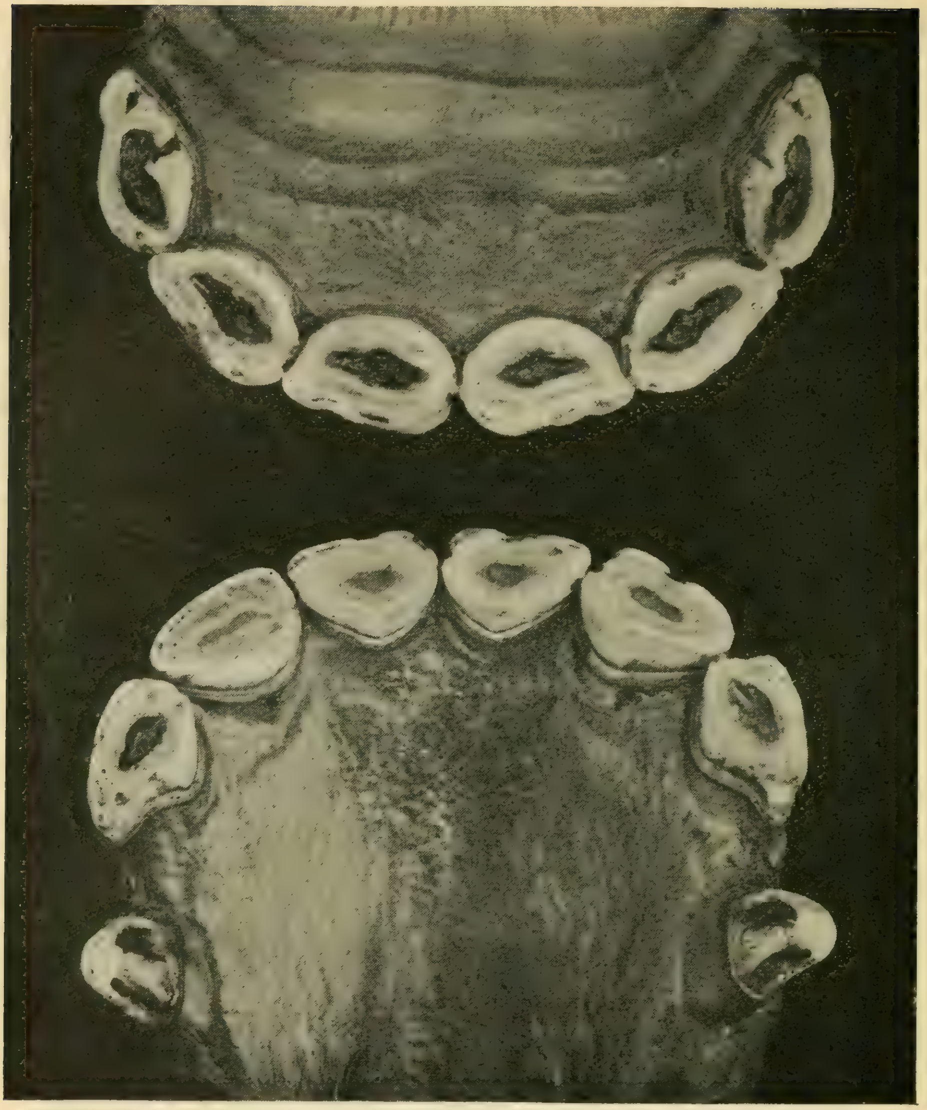


Fig. 244.—Tables of incisor teeth (nat. size).

The inner edge of the corner incisors is worn level with the outer edge, and the central enamel of these teeth forms a complete ring, except when it is fissured, as in the corner upper incisor of the near side. The tables of the central incisors tend to assume an oval form. The tables of the lower central incisors at this age are, as a rule, worn level; the dental cavity having disappeared out of them, and, in some cases, out of the lower lateral incisors. The central incisors, viewed from the front, are slightly whiter than at five years old, on account of their beginning to lose their coating of cement.

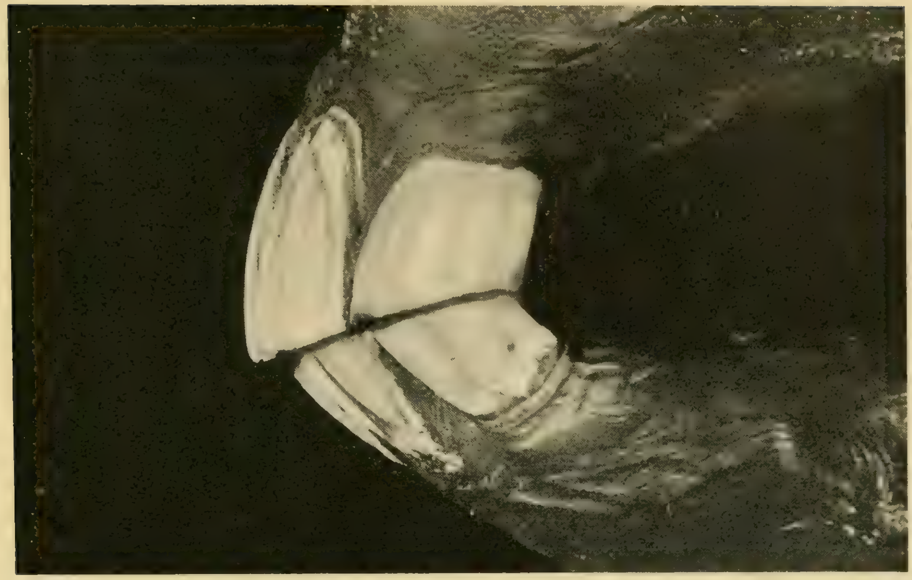


Fig. 245.—Side view of incisors.

The neck of the upper corner incisor shows a marked decrease in width. Usually, the posterior edge of the lower corner incisor is well in advance of that in the upper jaw; but not in this case, owing to the fact of the horse being inclined to parrot-mouth.

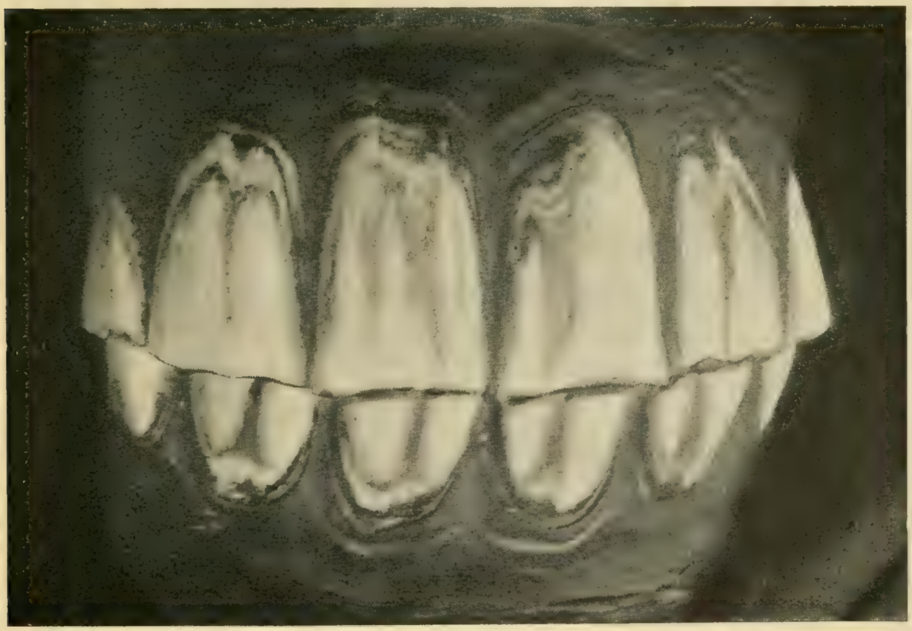


Fig. 246.—Front view of incisors.

The incisor teeth have increased in length, and their necks have decreased in width.

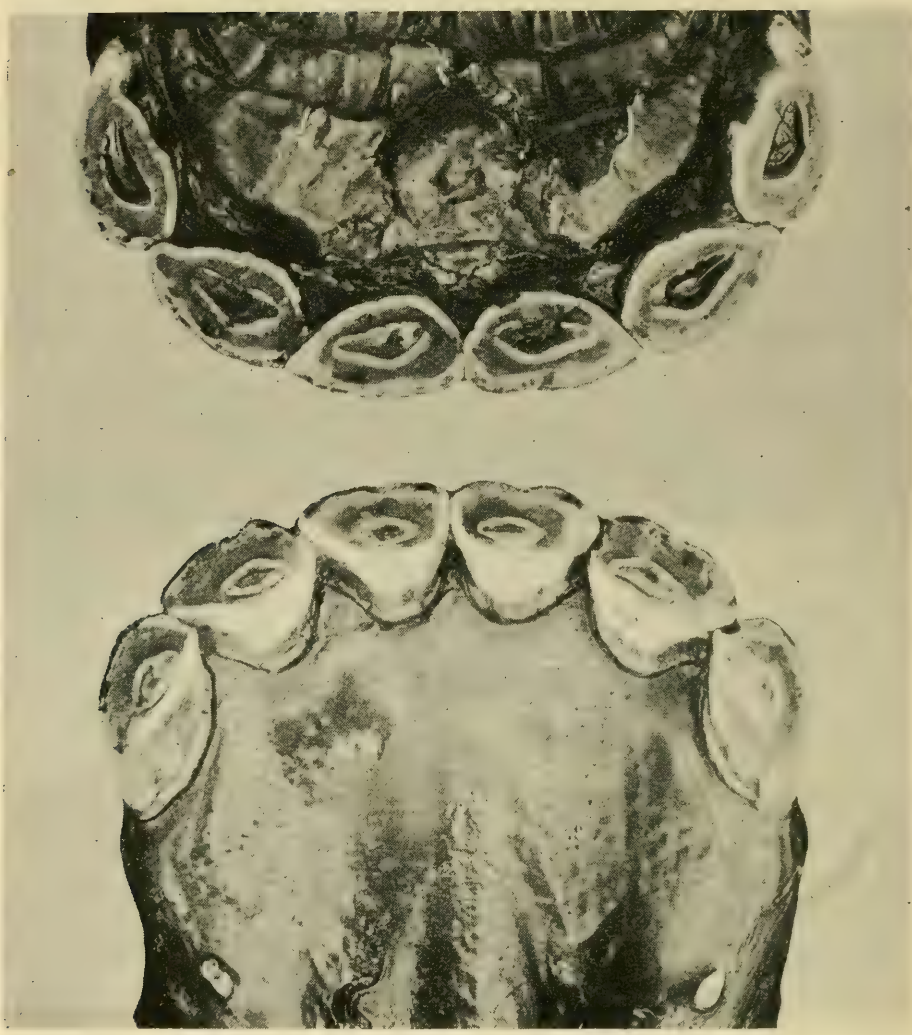


Fig. 247.—Mare's mouth, showing tables of incisors and the presence of rudimentary tushes.

In this case, the respective tables of the lower incisors show about the same amount of wear and their "marks" have disappeared, probably on account of the tendency to parrot-mouth (Fig. 245). Generally, the lower corner incisors retain their "marks" at this age.

· Fig. 248.—Side view of incisors (nat. size).

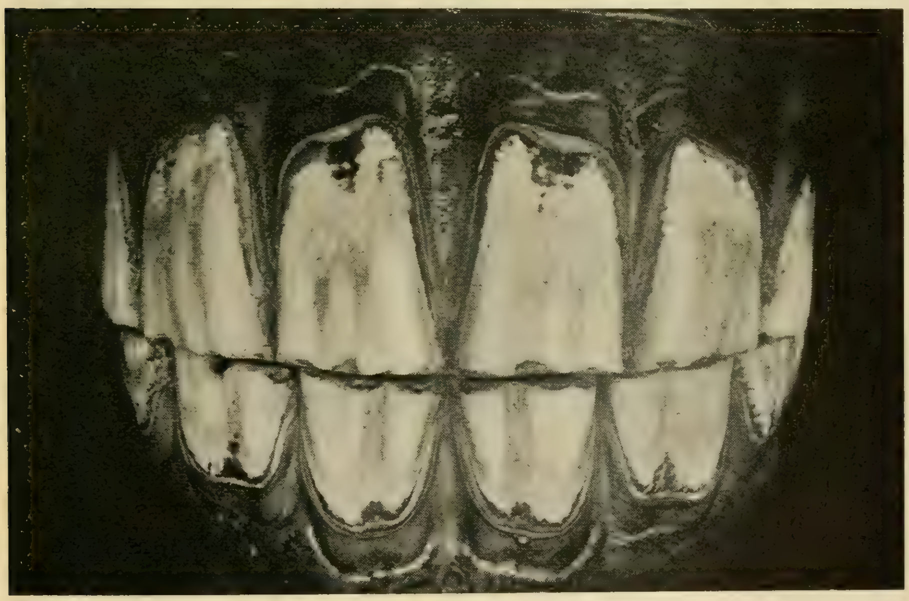


Fig. 249.—Front view of incisors (nat. size).

The decrease in width of the neck of the upper central incisors is well marked. This mouth shows slight signs of cribbing.

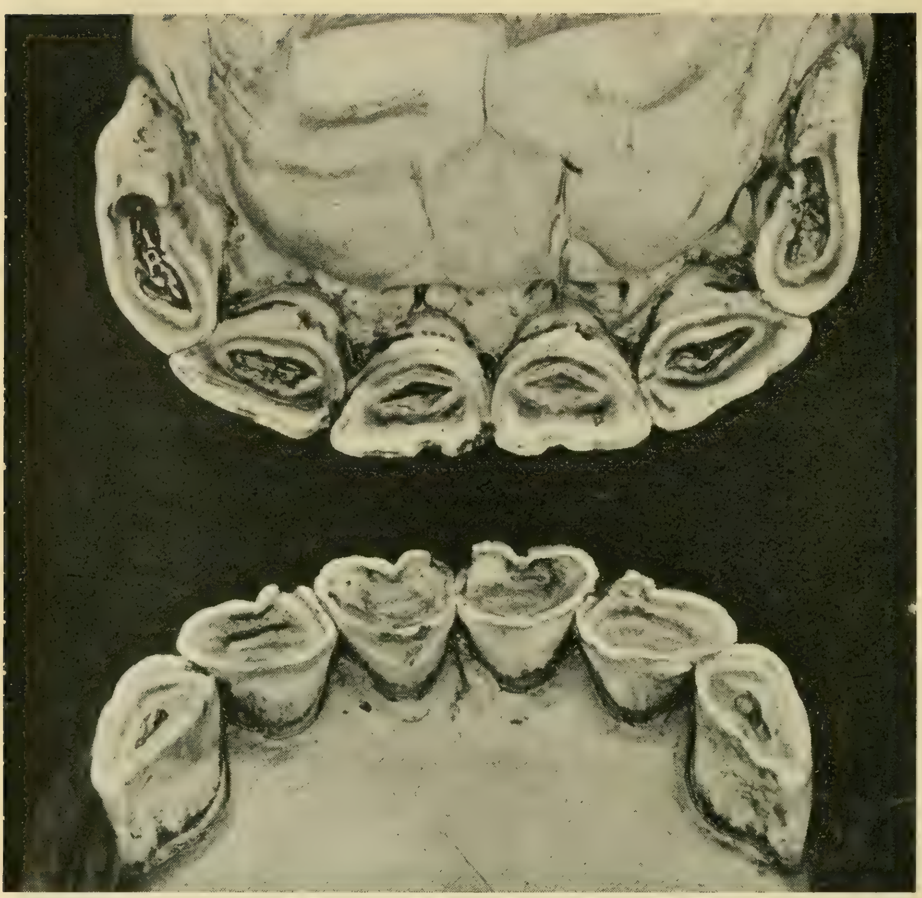


Fig. 250.—Tables of incisors (nat. size).

The lower corner incisors have lost their cavities. The width of the tables of the central incisors of both jaws (Fig. 250) has considerably decreased. The curve formed by the tables of the central and lateral incisors of the upper jaw is much flatter than in Fig. 244.

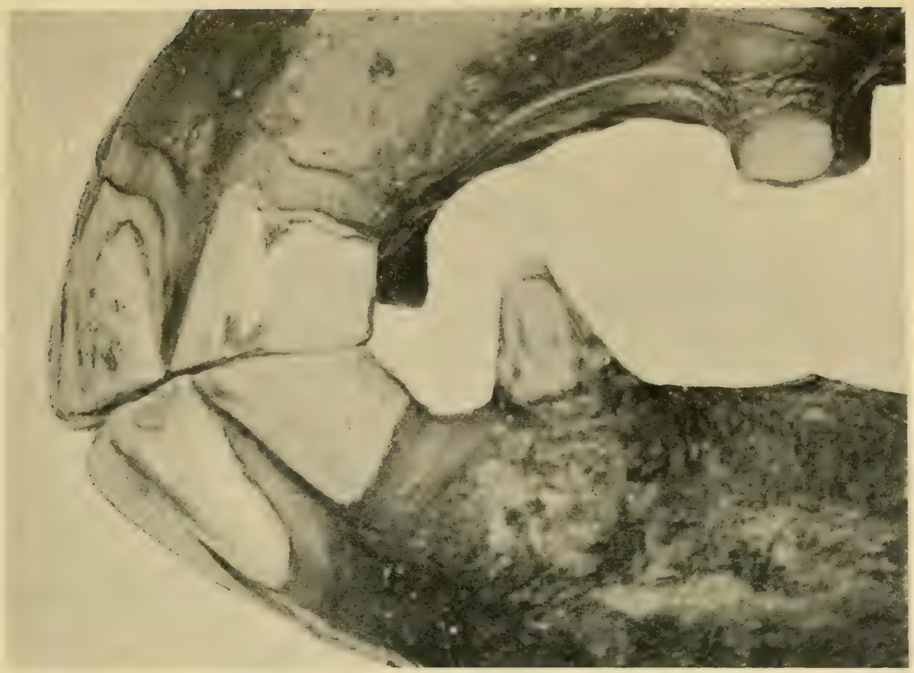


Fig. 251.—Side view of incisors (nat. size).

Fig. 252.—Front view of incisors (nat. size).

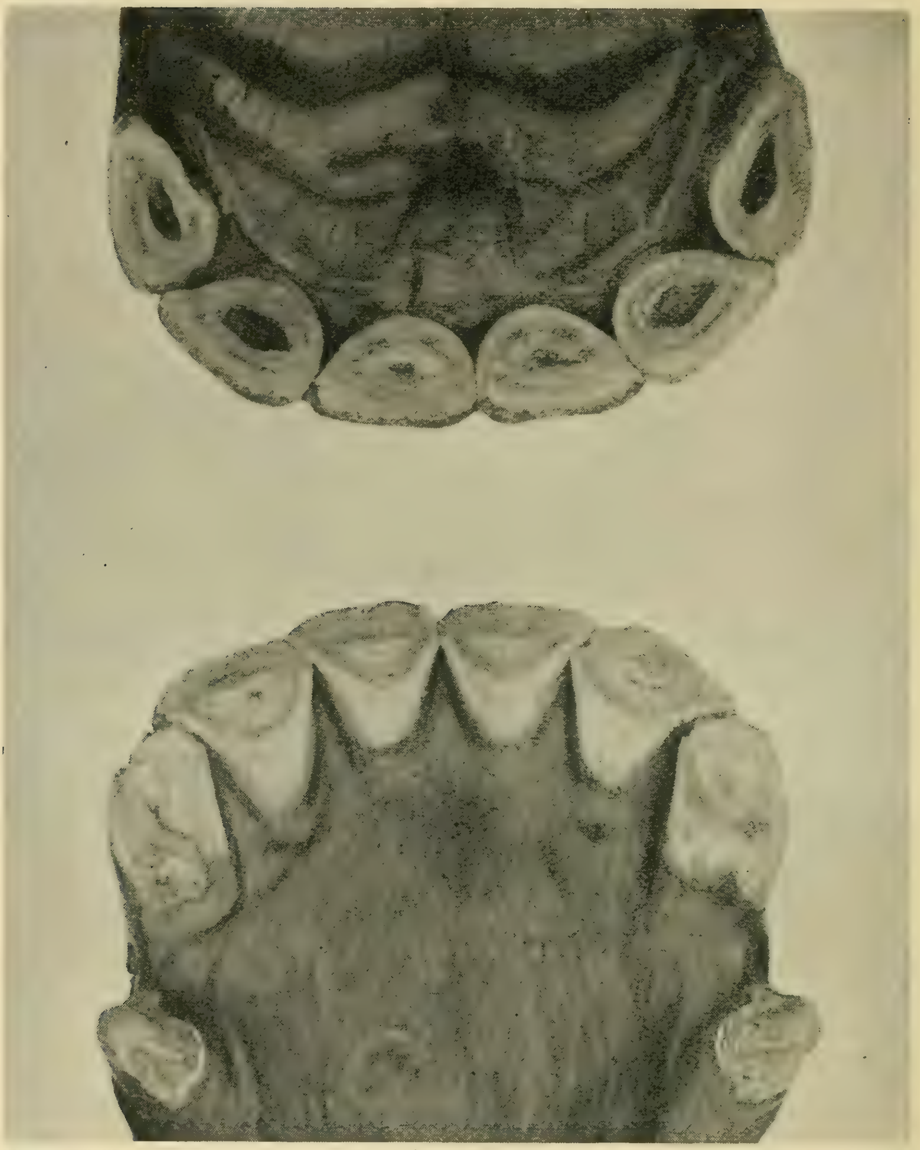


Fig. 253.—Tables of incisors (nat. size).

Indications of crib-biting are visible in this mouth. A slight groove has begun to show at the neck of the upper corner incisor (Fig. 251). The cavities have disappeared out of the upper central incisors, and all the incisors have decreased in width.

Fig. 254.—Side view of incisors (nat. size).

In the upper corner incisor, there is a well marked hook formed by the abnormally advanced position of the lower corner incisor.

Fig. 255.—Front view of incisors (nat. size).

Fig. 256.—Side view of incisors (nat. size).

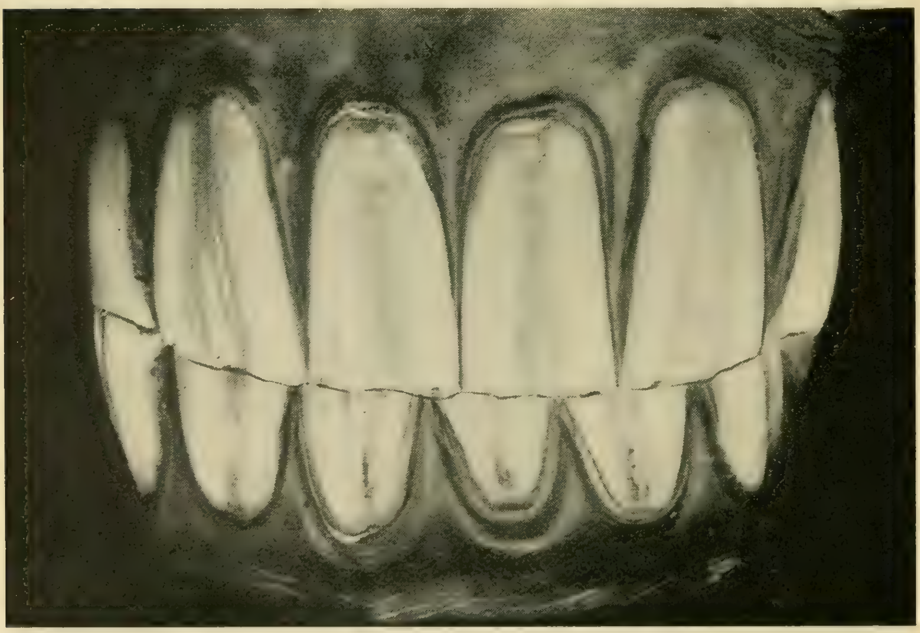


Fig. 257.--Front view of incisors (nat. size).

Fig. 258.—Tables of incisors (nat. size).

The chief features in these teeth (Figs. 256, 257 and 258) are: increased length of crown; decrease of width of the neck of the corner incisors of the upper jaw (Fig. 256); increased obliquity of the lower incisors; and decrease of the width of the tables of the central and lateral incisors (Fig. 258), which fact brings them nearly into a straight line in each jaw. Hence, when seen from the front (Fig. 257), the upper corner incisors are well in view. The fact that the upper incisors partly cover the lower incisors of the mouth shown in Fig. 256, gives a false appearance of obliquity to the lower incisors in Fig. 257.

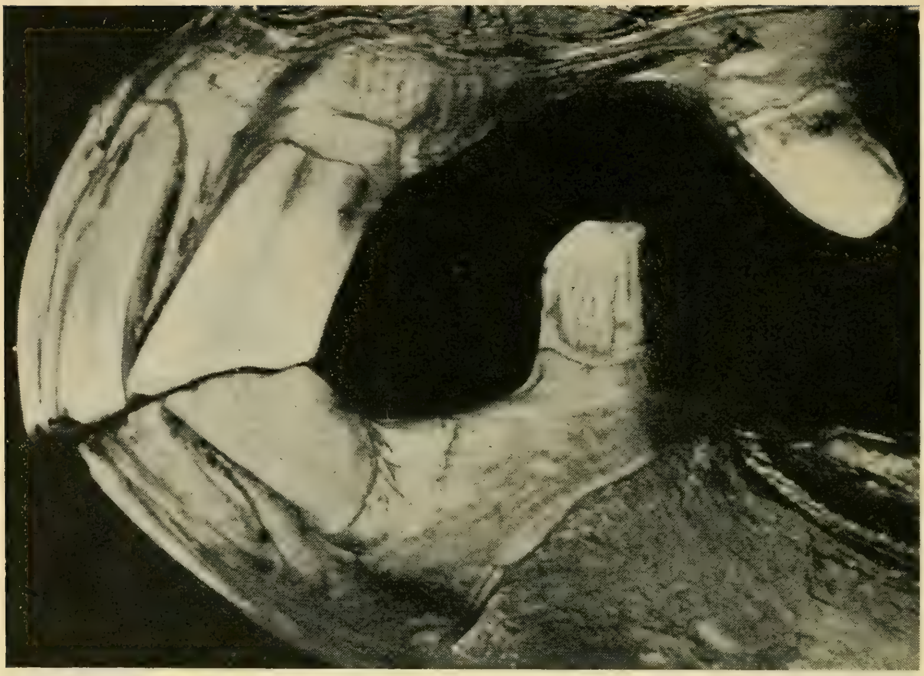


Fig. 259.—Side view of incisors (nat. size).

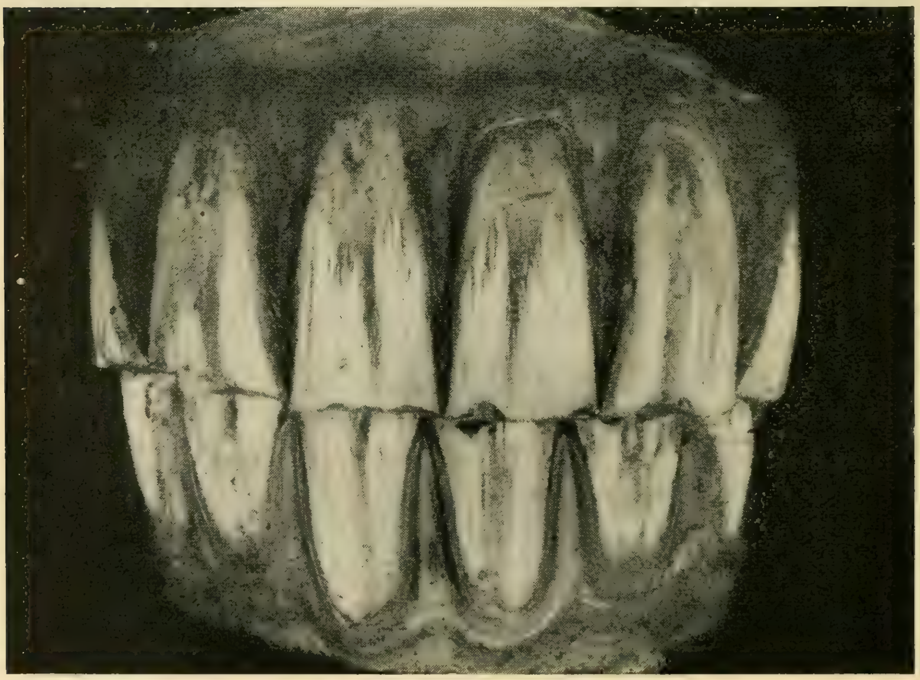


Fig. 260.—Front view of incisors (nat. size).

Fig. 261.—Tables of incisors (nat. size).

The angle formed by the corner incisors (Fig. 259) has considerably increased in acuteness, and the necks of the upper incisors (Figs. 259 and 260) have become much narrower. Strange to say, the tables of the teeth (Fig. 261) give them the appearance of being younger than those in Fig. 258. Side and front views would correct any mistake arising from this cause.

Fig. 262.—Side view of incisors (nat. size).

Fig. 263 —Front view of incisors (nat. size).

Fig. 264.—Tables of incisors (nat. size).

From Figs. 262, 263 and 264, we see that in old age, the chief alterations in the incisor teeth consist in increased length of their crowns and decreased width of their necks and tables. The curve formed by the tables of the incisors does not become flatter after, say, 14 years.

In the mouth shown in Figs. 147, 148, and 149 (pp. 557, 559, and 561), the chief indication of advanced senility is the great acuteness of the angle formed by the corner incisor teeth (Fig. 147). In this case, the lower tush has kept its usual length. Both tushes in Fig. 262 are well worn down. The near side lower tush in Fig. 267 is also in good preservation.

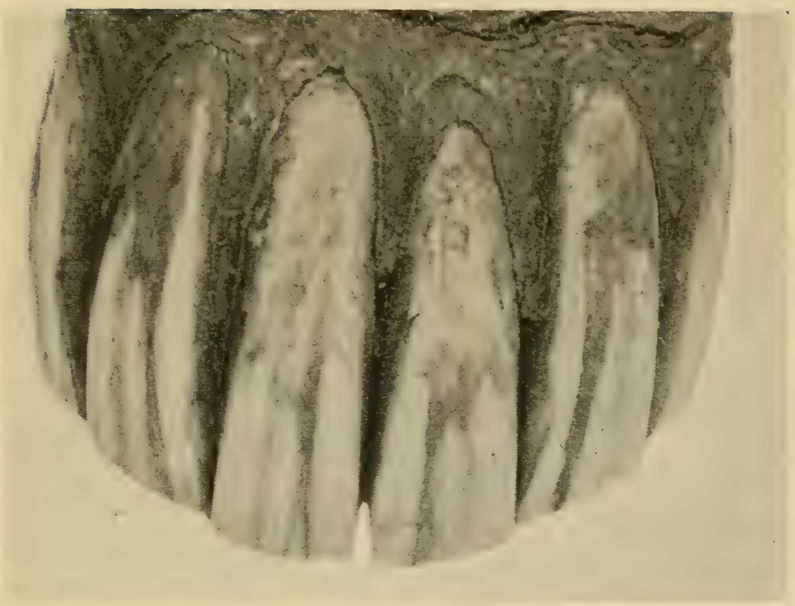


Fig. 265.—Front and perpendicular view of upper incisors (nat. size).

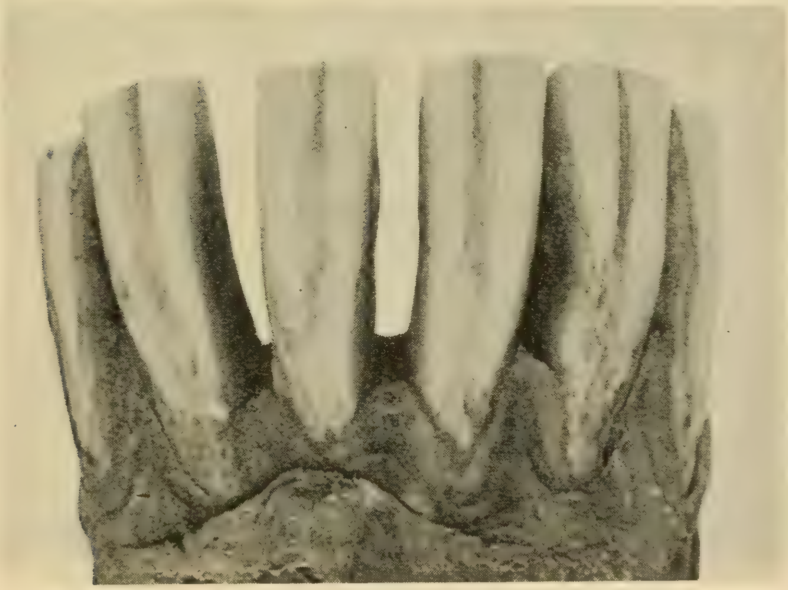


Fig. 266.—Front and perpendicular view of lower incisors (nat. size).

Fig. 267.—Tables of incisors.

The great increase in the length and great decrease in the width of the crowns of the lower incisors are remarkable.

INDEX OF SUBJECTS.

LIST OF AUTHORITIES AND PUBLICATIONS QUOTED.

List of Books on Horses

By CAPTAIN M. HORACE HAYES, F.R.C.V.S.

The Field.—"As trainer, owner and rider of horses on the flat and over a country, the author has had a wide experience, and when to this is added competent veterinary knowledge, it is clear that CAPTAIN HAYES is entitled to attention when he speaks."

PUBLISHED BY
MESSRS. HURST & BLACKETT, LTD.
13, Great Marlborough Street, W.

BOOKS ON HORSES.

VETERINARY NOTES for HORSE-OWNERS An Illustrated Manual of Horse Medicine and Surgery, written in simple language, with 267 Illustrations. Sixth Edition. Revised throughout, considerably enlarged, and 121 new and original Photographs added. Large crown 8vo, buckram, 15s. net.

"A necessary guide for horse-owners, especially those who are far removed from immediate professional assistance."—*The Times.*

"Of the many popular veterinary books which have come under our notice, this is certainly one of the most scientific and reliable."—*The Field.*

"This book leaves nothing to be desired on the score of lucidity and comprehensiveness."—*Veterinary Journal.*

"It is superfluous to commend a book that is an established success, and that has gone on from edition to edition extending its usefulness."—*Army and Navy Gazette.*

POINTS OF THE HORSE. A Familiar Treatise on Equine Conformation. Third Edition in the Press.

"Capt. Horace Hayes, the best of writers upon horses, has issued a second edition—considerably altered and enlarged, and magnificently illustrated—of his admirable work upon the 'Points of the Horse,' which is, in fact, a complete work on horses, their races and peculiarities."—*Athenæum.*

"The intrinsic value of the book and the high professional reputation of the author should ensure this new edition a cordial welcome from sportsmen and all lovers of the horse."—*The Times.*

RIDING AND HUNTING. Fully Illustrated with upwards of 250 Reproductions of Photographs and Drawings. In 1 vol., demy 8vo, cloth. Price 16s. net.

"Capt. Hayes has produced a book which cannot fail to interest, if not to instruct the experienced horseman, and the beginner may learn from its pages practically all that it is necessary for him to know."—*The World.*

"We can imagine no more suitable present for one who is learning to ride than this book."—*Pall Mall Gazette.*

"He is no doubt the greatest authority, both on horses and horsemanship, now living in this country. Everything which he writes is lucidly expressed, and no detail is too trivial to be explained."—*The Spectator.*

THE HORSEWOMAN. A Practical Guide to Side-Saddle Riding. By MRS. HAYES. Edited by CAPT. M. H. HAYES. Second Edition, re-written, enlarged, and with about 150 new and original Photographic Illustrations added. 1 vol., demy 8vo. 12s. net.

"This is the first occasion on which a practical horseman and a practical horsewoman have collaborated in bringing out a book on riding for ladies. The result is in every way satisfactory, and, no matter how well a lady may ride, she will gain much valuable information from a perusal of 'The Horsewoman.'"—*Field.*

"A large amount of sound, practical instruction, very judiciously and pleasantly imparted."—*The Times.*

"We have seldom come across a brighter book than 'The Horsewoman.'"—*The Athenæum.*

"With a very strong recommendation of this book as far and away the best guide to side-saddle riding we have seen."—*Saturday Review.*

LONDON: HURST AND BLACKETT, LIMITED.

STABLE MANAGEMENT AND EXERCISE.

A Book for Horse-Owners and Students. Illustrated by numerous Reproductions of Photographs taken specially for this work. In 1 vol., demy 8vo. Price 12s. net.

"Capt. Hayes, who may justly claim to be the first authority now living on all matters connected with the horse, is always welcome, and the more so because each successive volume is a monument of 'the reason why.'"—*The County Gentleman.*

"Eminently practical."—*The Field.*

"The work of an exceptionally competent authority, who thoroughly understands his subject, and is able to make the results of his practical knowledge clear to readers."—*Badminton Magazine.*

ILLUSTRATED HORSEBREAKING. Second and Cheaper Edition. Large crown 8vo. Price 12s. net.

This Edition has been entirely rewritten, the amount of the letterpress more than doubled, and 75 reproductions of Photographs have been added.

"It is a characteristic of all Captain Hayes' books on horses that they are eminently practical, and the present one is no exception to the rule. A work which is entitled to high praise as being far and away the best reasoned-out one on breaking under a new system we have seen."—*The Field.*

"The work is eminently practical and reliable."—*Veterinary Journal.*

HORSES ON BOARD SHIP. A Guide to their Management. By M. H. Hayes. In 1 vol., crown 8vo, with numerous Illustrations from Photographs taken by the Author during two voyages to South Africa with horses. Price 3s. 6d. net.

"The book altogether is like the rest of Captain Hayes' works, written on sound, practical lines, and is all the more welcome in that it deals with a subject on which we have yet a great deal to learn."—*The Field.*

"As he has had two voyages to South Africa in charge of large consignments, his experience is eminently practical, and his book contains much valuable information, and ought to enable the War Office to avoid in the future some of the errors of the past."—*Morning Post.*

"We are sure that the book will be found useful and instructive to those who are new to the work of conveying either large or small numbers of horses across the seas."—*County Gentleman.*

TRAINING AND HORSE MANAGEMENT IN INDIA. Fifth Edition. Crown 8vo, cloth, 6s.

"We entertain a very high opinion of Capt. Hayes' book on 'Horse Training and Management in India,' and are of opinion that no better guide could be placed in the hands of either amateur horseman or veterinary surgeon newly arrived in that important division of our Empire."—*Veterinary Journal.*

INFECTIVE DISEASES OF ANIMALS. Being Part I. of the Translation of Friedberger and Frœhner's Pathology of the Domestic Animals. Translated and Edited by the Author. With a Chapter on Bacteriology by Dr. G. Newman, D.P.H. Demy 8vo, 10s. 6d. net.

"Whether considered as a work of reference for busy practitioners, as a text-book for students, or as a treatise on pathology in its widest significance, this volume meets every requirement, and is an invaluable addition to our literature."—*Veterinary Record.*

AMONG HORSES IN RUSSIA. With 53 Illustrations from Photographs taken chiefly by the Author. In 1 vol., large crown 8vo. Price 10s. 6d. net.

"The book is exceedingly well written and illustrated."—*Graphic.*

"The author has made an exceedingly entertaining book of his experiences."—*Baily's Magazine.*

AMONG HORSES IN SOUTH AFRICA. In 1 vol., crown 8vo. Price 5s.

"Capt. Hayes' book is genuinely interesting, and fully repays reading."—*Black and White.*

"The book is very readable."—*Spectator.*

"The book is written in a pleasant, chatty style, and with a broad mind."—*Sportsnma.*

MODERN POLO. By Captain E. D. MILLER, late 17th Lancers. Edited by Captain M. H. HAYES. Second Edition, revised and enlarged. In one vol., demy 8vo., with numerous Illustrations from Photographs and Drawings. Price 16s. net.

"Both in the matter of polo-playing and in that of choosing or breeding polo ponies, the volume is a certain authority."—*The Times.*

"'Modern Polo,' written by E. D. Miller and edited by Capt. M. H. Hayes, will assuredly become the authoritative work concerning the game, which is rapidly growing in favour in this country. It is clear and bright in style, and it is provided with numerous illustrations from photographs."—*Black and White.*

"Mr. Miller's is by no means the only work upon the Game of Polo, but it is, at least, the most complete and comprehensive work upon the subject that has yet been issued. It has had the benefit, too, of the editorship of Capt. M. H. Hayes, one of the best authorities of the day in regard to all matters connected with horsemanship. To Capt. Hayes are also due the excellent photographs by which the book is illustrated, showing almost every turn and stroke in a rather complicated game."—*Graphic.*